THE AMPHIPOD SUPERFAMILY HADZIOIDEA ON THE PACIFIC COAST OF NORTH AMERICA: FAMILY MELITIDAE. PART I. THE *MELITA* GROUP: SYSTEMATICS AND DISTRIBUTIONAL ECOLOGY.

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ABSTRACT

In the North American Pacific coastal marine region, from the Bering Sea to Central California, species of the *Melita* group of gammaridean amphipod crustaceans (family Melitidae) had previously been assigned to the genera *Melita* Leach, 1814 (revised Karaman, 1981), *Abludomelita* Karaman, 1981, and *Dulichiella* Stout, 1912. Within genus *Melita* (type species - *M. palmata* Montagu, 1814), the following taxa from the North American Pacific coast are here newly described or redescribed, and keyed: *Melita oregonensis* J. L. Barnard, 1954; ***Melita* alaskensis,** new species; *Melita sulca* (Stout, 1913) and *Melitida nitida* Smith, 1873. The following taxa are removed from the concept of genus *Abludomelita* Karaman, 1981 sens. str.: ***Megamoera*** Bate, 1862, containing type species *Megamoera dentata* (Kroyer 1842); *M. subtener* (Stimpson, 1964); ***M. bowmani***, new species; ***M rafiae***, new species; *M. mikulitschae* (Gurjanova, 1953); *M. kodiakensis* (J. L. Barnard, 1964); *M. amoena* (Hansen, 1888); ***M. unimaki***, new species; ***M. glacialis***, new species and ***M. borealis***, new species; ***Quasimelita***, new genus, with type species *Quasimelita quadrispinosa* (Vosseler, 1889); *Q. formosa* (Murdoch, 1885) and *Q. abyssorum* (Stephensen, 1944); ***Desdimelita***, new genus, with type species *D. desdichada* (J. L. Barnard, 1962); *D. californica* (Alderman, 1936); ***D. microdentata***, new species; ***D. microphthalma***, new species and ***D. barnardi***, new species. *Melitoides* Gurjanova, 1934, with type species *M. makarovi* Gurjanova, 1934, is here recognized as part of the *Abludomelita* complex of genera. *Melita valida* Shoemaker, 1955, from Pt. Barrow Alaska, is provisionally assigned to *Melitoides*. The genus *Abludomelita* Karaman, 1981, is now restricted to a complex of Mediterranean and Indo-Pacific species (type species - *A. gladiosa* (Bate, 1862)) of which *A. denticulata* (Nagata, 1965), *A. japonica* (Nagata, 1965), *A. unamoena* (Hirayama, 1987), *A. somovae* (Bulycheva 1952) and *A. sexstachya* (Gamo, 1977) are aberrant eastern Asiatic representatives. *Abludomelita* is considered ancestral to the warm temperate genus *Dulichiella* Stout, 1912, represented on the North American coast by the type species *Dulichiella spinosa* Stout, 1912, and on the Asiatic coast by two apparently unnamed species.

Biogeographically, of the 40 species within the *Abludomelita* and *Melita* generic complexes here recorded from the North Pacific region, the North American and Asiatic species are about equal in number, but very different in taxonomic composition. Only 3 species are common to the two coasts, and these only in the Bering Sea region. Thus, the subarctic-boreal *Abludomelita* complex is represented by 21 species along North American shores, including 9 species of *Megamoera*, 6 species of *Desdimelita*, but none of *Abludomelita*. By contrast, only 9 species of this complex occur along the Asiatic coast, including 5 species of *Abludomelita*, 2 species of *Megamoera*, but none of *Desdimelita*. Also by contrast, at least twelve species of the tropical and warm temperate genus *Melita* are known from the Asiatic coast, but only four species from North American shores. Several mainly Indo-Pacific generic complexes within the *Melita* group, including the *Eriopisa, Eriopisella, Carnarimelita* and *Rotomelita* subgroups, penetrate southern fringes of the North Pacific region, including the Hawaiian islands, but are not treated in detail here.

Behaviourally and ecologically, the animals are free-swimming and free-crawling omnivores, mainly of under-rock habitats, at intertidal to shallow-sublittoral depths, but a few are bathyal to abyssal. Diminution of setation of mouthparts, especially the facial setae of the inner plate of maxilla 2, and concomitant enlargement of gnathopod 2, especially among deeper water species of the *Abludomelita* complex, may correlate with differences in feeding and life styles. Sexual dimorphism of gnathopod 1 and coxa 6, correlated elsewhere with a unique form of pre-amplexing "carrying" behaviour, attains its highest level of specialization in the genus *Melita*. Sexual dimorphism of gnathopod 2 that may be correlated with reproductively significant percussive sound production, is pronounced in *Abludomelita*, and most specialized in *Dulichiella*.

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INTRODUCTION

The *Melita* group within amphipod family Melitidae is a relatively recent taxonomic concept that was first formally diagnosed as "melitids" by Barnard & Barnard (1983). However, their concept included a number of generic groups such as (1)*Eriopisa, Victoriopisa, Maleriops*, and (2)*Paraniphargus, Psammogammarus* and *Galapsiellus* some of which appear more closely related to other generic groups within the family (p. 5). The concept of "*Melita* group" is here restricted to the genera *Melita, Dulichiella, Rotomelita, Nainola, Tegano, Anchialella, Josephella, Eriopisa, Eriopisella,* and other closely related genera described since that time.

The genus *Melita* was first described by Leach (1814), with *Cancer palmatus* Montague, 1804, as its type species. In the major compendium of Stebbing (1906), this generic name was applied to gammaroidean animals with a dispariramous or markedly inaequiramous uropod 3 and markedly unequal, sexually dimorphic gnathopods 1 & 2. Following suppression of the genus *Megamoera* Bate (1862), having *M. dentata* Krøyer as its type species, and subsequent to several species synonymies, the genus *Melita* had become restricted to 12 formally recognized species. In 1912, Stout proposed *Dulichiella* for her new Californian melitid species, *D. spinosa* , and in 1913 erected the genus *Calliniphargus* , for her newly described *C. sulca* . However, these names were later submerged within the genus *Melita* by Barnard (1969a) who then recognized 45 world species.

In 1977, the junior author (ELB) revised and formalized earlier attempts (e.g., Melitidae Bousfield, 1973) to bring classificatory order into the very large and unwieldy family taxon then known popularly as "good old Gammaridae". Superfamily Gammaroidea (and several endemic families) were proposed for *Gammarus*-like animals having somewhat similar-sized, usually sexually dimorphic and pre-amplexing gnathopods 1 & 2, and occurring mainly epigeically in fresh waters of the northern hemisphere. Superfamily Melitoidea (now Hadzioidea) was erected to encompass a revised and restricted family Melitidae (e.g., *Melita- and Maera*-like genera, having lower lips with distinct inner lobes, and occurring mainly epigeically in marine habitats) and family Hadziidae (e.g., hadziid, weckeliid, and grossly similar genera, lacking inner lobes, and mainly hypogean in brackish and fresh water habitats). As the splitting of unwieldy larger amphipod taxa rapidly became a more realistic nomenclatural trend, Barnard & Barnard (1983) recognized the monotypic genera *Dulichiella* Stout, 1912; *Melitoides* Gurjanova, 1934; *Rotomelita* Barnard, 1977; *Anchialella* Barnard, 1979, *Nainaloa* Karaman & Barnard, 1979; and *Tegano* Karaman & Barnard, 1982. Nonetheless, the genus *Melita* Leach per se had by then expanded to 60 recognized world species.

In 1981, Gordan Karaman proposed a major subdivision of the genus into *Melita,* based on the nominate type species, *M. palmata* (Montagu, 1804), and *Abludomelita,* new genus, with the Mediterranean species *A. obtusata* (Montagu, 1813) as its type. Karaman defined the genus *Abludomelita*, encompassing 25 world species, as follows: maxilla 1, inner plate triangular, inner margin setose; maxilla 2, inner plate with dorsal (facial) oblique row of setae; uropod 3, outer ramus 2-segmented. The genus *Melita,* encompassing 27 recognized species, was defined as follows: maxilla 1, inner plate triangular, with a row of distomarginal setae; maxilla 2, inner plate lacking dorsal oblique row of setae; uropod 3, outer ramus consisting of one segment only. Karaman (loc. cit.) also more narrowly defined the genus *Dulichiella*, with 11 species, as having: maxilla 1, inner plate narrowly conical, apex with only 1-2 plumose setae; maxilla 2, inner plate with oblique row of dorsal setae; left and right gnathopod 2 (male) unequal in size, with distolateral corner of propod produced, and dactyl strong; uropod 3, outer ramus 2-segmented.

Since that time, however, Karaman's revision has come under the close scrutiny of several authors (e.g., Zeidler, 1989; Yamato, 1990, etc.). Karaman's diagnostic criteria appear not correctly applicable to some species he included within the pertinent genera. Several other taxonomic character states, more conspicuous and possibly more phyletically significant, were deemed utilizable for the groups concerned. The subsequent erection of several new melitid genera (e.g. *Josephella* Stock, 1984; *Allomelita* Stock, 1984; *Quadrus* Karaman, 1984; *Carnarimelita* Bousfield, 1990), has further increased the need for expanded character-state consideration in melitoidean generic diagnoses. Finally, recent examination of a wealth of new species, both by Japanese workers in materials from the western North Pacific region (e.g. especially by Hirayama, 1987; Yamato 1988, 1990), and in materials from eastern north Pacific region here demonstrated, has necessitated a major new look at the classificatory status of the *Melita* group of species. It seems therefore that the *Melita* complex consists of *Melita*, sens. str. and taxonomically "aberrant" inclusives, *Abludomelita* and its subdivisions, *Dulichiella* , and other melitid genera whose relationships have yet to be more precisely clarified.

Investigations on the North American Pacific melitid group commenced more than a century ago with W. Stimpson's accounts (1856, 1864) of amphipods from California and survey material obtained by the Puget Sound Boundary Commission, and Walker's (1898) record of *Melita dentata* from Puget Sound. This work had followed J. D. Dana's (1852) account of melitids among crustaceans of Hawaii, all summarized by Stebbing (1906), including species since removed to other amphipod families. In the early 20th century, studies on the melitid group of California were initiated by Vinnie R. Stout (1912, 1913) and A. L. Alderman (1936). In the years following WWII, however, enormous impetus to the study of the regional melitid group was provided by J. L. Barnard (1952 through 1983). Arctic Alaskan records were summarized by C. R. Shoemaker (1955), and records of melitids introduced through commerce to western N. America were collated by J. W. Chapman (1988). Melitid records from British Columbia were summarized notably by G. H. Wailes (1931) and W. C. Aust-

in (1985). Records of common melitid species were utilized in keyed and illustrated popular guides by E. F. Ricketts & J. Calvin (1968), by J. L. Barnard (1975), and by C. P. Staude (1987).

In the western North Pacific region, studies on the melitid group were initiated, much more recently, by Eupraxie F. Gurjanova (1934, 1936, 1938). Publications on the far eastern fauna of the USSR continued after WWII with Gurjanova's major compendium (1951) and shorter papers (e.g., 1965), with A. I. Bulycheva (1952, 1955) and with the regional faunal lists of others (e.g., V. L. Kudryaschov, 1972). Serious taxonomic work on the melitid fauna of Japanese waters commenced with the studies of M. Ueno (1940) and K. Stephensen (1944), followed by that of K. Nagata (1960, 1965). During recent years, many new regional records and much detailed work on this group have been published by A. Hirayama (1978, 1986, 1987), Hirayama & T. Kikuchi (1979), S. Gamo (1977), Gordan Karaman (1979), and S. Yamato (1985, 1987, 1988, 1990). The present writers have touched only on the principal studies; these and listings of species from Japanese waters by several others, have been ably summarized by S. Ishimaru (1994).

The present study treats the systematics and distributional ecology of *Melita* group amphipods that occur in the North American Pacific coastal marine region, from western Alaska to central California, and relates this fauna to that of the adjacent western North Pacific and world-wide marine regions.

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SYSTEMATICS

Family Melitidae Bousfield

Melitidae Bousfield, 1973: 61.—Bousfield, 1977: 299 (revised).—Bousfield, 1982: 281.—Barents, 1983: 103.—Lowry & Fenwick, 1983: 201.—Barnard & Karaman, 1991: 545 (part).—Ishimaru, 1994: 49.
"Melitids" Barnard & Barnard, 1983: 662 (part).

Type genus. *Melita* Leach, 1814.

Recent Genera.

Melita group (includes *Melita* group of Barnard & Barnard, 1983): *Abludomelita* G. Karaman; *Allomelita* Stock; *Anchialella* J. L. Barnard; *Carnarimelita* Bousfield; *Confodiopisa* Karaman; *Desdimelita*, n. g. (p. 40); *Dulichiella* Stout; *Eriopisa* Stebbing; *Eriopisella* Chevreux; *?Galapsiellus* J. L. Barnard; *Impertiopisa* Karaman; *Josephella* Stock; *Maleriopa* Barnard & Karaman; *Megamoera* Bate; *Melita* Leach; *Melitoides* Gurjanova; *Nainola* Barnard & Barnard; *Netamelita* J. L. Barnard; *Nippopisella* Stock; *?Paraniphargus* Tattersall; *Psammogammarus* S. Karaman; *Quadrus* G. Karaman; *Quasimelita*, n. g. (p. 36); *Roropisa* G. Karaman; *Rotomelita* J. L. Barnard; *Tegano* Barnard & Karaman; *Thalassostygius* Vonk; *Tunisopisa G. Karaman*; *Victoriopisa* Karaman & Barnard.

Maera group (includes the *Ceradocus, Paraceradocus* and *Maera* groups of Barnard & Barnard, 1983): *Anelasmopus* Oliveira, *Bathyceradocus* Pirlot; *Beaudettia* J. L. Barnard; *Ceradocus* Costa, *Ceradocoides* Nicholls, *Ceradomoera* Ledoyer; *Coxomaerella* G. Karaman; *Dumosus* Thomas & Barnard; *Elasmopoides* Stebbing; *Elasmopus* Costa; *Hoho* Lowry & Fenwick; *Ifalukia* J. L. Barnard; *Jerbarnia* Croker; *Lupimaera* Barnard & Karaman; *Maera* Leach; *Maerella* Chevreux; *Maeropsis* Chevreux; *Mallacoota* J. L. Barnard; *Metaceradocus* Chevreux; *Meximaera* J. L. Barnard; *Paraceradocus* Stebbing, *Parelasmopus* Stebbing, *Quadrivisio* Stebbing.

Other groups. Barnard & Barnard (1983) have summarized other groups within family Melitidae, viz., *Gammarella* group of *Gamarella* Bate and *Tabatzius* McKinney & Barnard; *Parapherusa* group of *Parapherusa* Stebbing; *Ceradocopsis* group of *Ceradocopsis* Schellenberg and *?Metaceradocoides* Birstein & Vinogradov.

Diagnosis. Peraeon generally smooth. Abdomen often mid-dorsally toothed or mucronate, rarely spinose or setose, or laterally toothed. Head, anterior lobe rounded, inferior antennal sinus reduced, often notch-like, rarely lacking entirely. Eye generally small, rounded, pigmented. Antenna 1, peduncles 1 & 2 elongate, 3 medium; accessory flagellum distinct, often short. Antenna 2 shorter than antenna 1, pedunclar segments 4-5 strong; flagellum relatively short.

Upper lip rounded or weakly notched below. Lower lip, inner lobes variously developed, distinct. Mandible: spine row strong; incisor and lacinia medium; palp often reduced

or weak, occasionally lacking, segments linear; molar usually with flake and plumose seta. Maxilla 1, inner plate triangular, inner margin and apex variously setose; outer plate with 9 (occ. 6-7) apical spines; left and right palps dissimilar. Maxilla 2, inner plate, facial row of setae variously developed or lacking. Maxilliped, palp strong, dactylate; inner plate usually with apical spines and inner marginal plumose setae; outer plate large, inner margin spinose.

Coxae 1-4 medium, hind margins often cuspate, 4th variously excavate behind. Gnathopods strongly sexually dimorphic, those of male pre-amplexing or agonistic in function. In males, gnathopods 1 & 2 markedly unequal in size; gnathopod 2, propod and dactyl large, powerful; carpus often short, hind lobe narrow, deep; gnathopods of female smaller, often slender and subsimilar, regularly subchelate. Peraeopods 3 & 4 variously unequal in size (4 smaller). Coxae 5-7 shallow, anterolobate. Peraeopod 5 variously smaller than subequal peraeopods 6 & 7; bases usually broad, lobate; distally segments occasionally reversed; dactyls small to medium, occasionally long.

Pleon 3, hind corner usually produced, acuminate. Pleopods normal, strong, occasionally sexually dimorphic. Uropods 1 & 2, rami usually linear, marginally and apically spinose; peduncle of uropod 1 with baso-facial and disto-lateral spines. Uropod 3 usually strong, inaequiramous; ramal margins spinose, weakly or not setose; terminal segment of outer ramus variously present, or lacking.

Telson lobes separate, occasionally fused basally; apices usually acute, spinose.

Coxal gill on peraeopod 6 smallest. Brood plates narrow, short, with few simple marginal setae.

Taxonomic and Distributional commentary. Members of family Melitidae occur mainly along tropical-warm-temperate littoral marine coastlines, but also not uncommonly in arctic-subarctic, antiboreal, and antarctic shelf regions. A few are hadal or abyssal. Others have penetrated coastal anchialine and fresh waters and resemble members of the Hadziidae in the reduced condition of their mouthparts, ambulatory appendages, and lack of pigmented eyes.

Members of family Melitidae are normally distinct from members of family Hadziidae in the well developed inner lobes of the lower lip. However, most melitids differ more conspicuously in their generally larger size, strongly pigmented eyes, and variously dorsally toothed pleosome and urosome. Moreover, melitid gnathopods are typically robust and strongly sexually dimorphic, and their peraeopods, uropods, and pleopods are typically more strongly spinose and/or powerfully developed. On the other hand sexually dimorphic pleopods occur in certain hadziids, lacking in melitids. Further study is needed to evaluate the precise applicability of these differences in all subgroups within both families.

The present study is confined to North Pacific regional members of the *Melita* group. The *Maera* group is to be treated in a subsequent study (Jarrett & Bousfield, in prep.). The present concept of the *Melita* group differs little from that of Barnard & Barnard (1983), but has been updated to accommodate recent inclusions. Thus, species of *Rotomelita* and *Carnarimelita* occur regionally only in Hawaii and/or elsewhere mainly in the Indo-Pacific region. Species of *Anchialella* and *Galapsiellus* are restricted to the Galapagos Islands, and the genera *Nainaloa, Tegano, Paraniphargus, Quadrus* and *Maleriopa* are western Indo-Pacific only, well outside the present study region.

Ishimaru (1994) listed *Gammarella* (=*Cottesloe*) *cyclodactyla* Hirayama, 1978, in the melitid fauna of Japanese waters. Barnard & Barnard (1983) consider the *Gammarella* (=*Nuuanu)* group, as well as *Dulzura* and *Liagoceradocus* to be hadzioidean because of their simple lower lips and/or deeply posterolobate coxae of peraeopods 5-7. Ishimaru correctly included *Jerbarnia ledoyeri* within the Melitidae (rather than the Melphidippidae) of Japan. It is here placed tentatively within the *Maera* group because of its aequiramous uropod 3. The phyletic relationships of both genera merit further study.

The *Eriopisella* group, including *Netamelita* J. L. Barnard, is considered a separate subgroup within family Melitidae by Barnard & Barnard (1983). *Netamelita cortada* J. L. Barnard occurs in California and a further species, unnamed by Nagata (1960), occurs in coastal waters of Japan. *Tagua* Lowry & Fenwick, 1983, with its monotypic species from Auckland and Snares Islands, is related to *Netamelita.* However, its posterolobate coxae, uropod 3 with relatively long, broad proximal segment and lacking a terminal segment, and relatively apomorphic mouthparts, appear at least convergently similar to those of *Eriopisa* within *Melita* group.

Melita group Barnard & Barnard, revised

Melita group Barnard & Barnard, 1983: 662 (part).

Type genus. *Melita* Leach, 1814: 403.

North Pacific Genera of the *Melita* group: *Abludomelita* G. Karaman; *Carnarimelita* Bousfield; *Desdimelita*, n. g. (p. 40); *Dulichiella* Stout; *Eriopisa* Stebbing; *Eriopisella* Chevreux; *Megamoera* Bate; *Melita* Leach; *Melitoides* Gurjanova; *Netamelita* J. L. Barnard; *Nippopisella* Stock; *Psammogammarus* S. Karaman; *Quasimelita*, n. g. (p.36); *Rotomelita* J. L. Barnard; *Victoriopisa* Karaman & Barnard.

Diagnosis. Uropod 3 inaequiramous, inner ramus very short, outer ramus primarily 2-segmented, margins spinose. Gnathopods 1 & 2 unequal in size (strongly so in male). Gnathopod 1 often, gnathopod 2 usually, sexually dimorphic. Gnathopod 2 (male) regularly subchelate; ischium not elongate. Peraeopods 5-7, dactyls short, rarely elongate. Pigmented eyes typically small, rounded.

Taxonomic commentary. The *Melita* group contrasts mainly with the *Maera (Ceradocus)* group in which uropod 3 is aequiramous (or nearly so), and gnathopod 1 is rarely sexually dimorphic.

KEY TO NORTH PACIFIC GENERA OF THE *MELITA* GROUP (FAMILY MELITIDAE)

1. Pleon segments 1-3, usually postero-dorsally toothed; urosome segments 1 and 2 with dorsal teeth . . 2.

—Pleon segments smooth or weakly toothed only; urosome 1 and/or 2 often lacking dorsal teeth. . . . . 3.

2. Gnathopod 2 (male), left and right propods large, subequal in size and form; uropod 3, outer ramus of normal width; maxilla 1, inner plate, inner margin setose. . . . . *Abludomelita* complex (p. 8)
—Gnathopod 2 (male) left or right propod and dactyl (not both) grossly enlarged; uropod 3, outer ramus slender, sublinear, rod-like; maxilla 1, inner plate with tuft of apical setae . . . .*Dulichiella* Stout (p. 12)

3. Gnathopod 1 (male), propod and dactyl usually strongly differing from female; anterior lobe of coxa 6 (female) usually modified, often hook-like; coxa 1 expanded distally . . . . . *Melita* Leach (p. 50)
— Gnathopod 1 propod and dactyl regularly subchelate, little (or not) sexually dimorphic; coxa 6 regular, little or not sexually dimorphic; coxa 1 little or not expanded distally . . . . . 4.

4. Coxa 4 of normal size, posterior margin with distinct distal portion and proximal excavation . . . . . *Rotomelita* J. L.Barnard (p. 7)
—Coxa 4 relatively small, posterior margin continuous, lacking proximal excavation . . . . . 5.

5. Uropod 3, outer ramus and terminal segment elongate; maxilla 1, inner plate triangular, apex acute, with inner marginal setae; maxiilla 2, inner plate with facial row of setae . . . *Eriopisa* complex (p. 7)
—Uropod 3, outer ramus normal (may lack terminal segment); maxilla 1, inner plate truncate, setae distal or apical; maxilla 2, inner plate lacking facial row of setae . . . . . 6.

6. Uropod 3, outer ramus 2-segmented . . . . . 7.
—Uropod 3, outer ramus 1-segmented . . . . . 8.

7. Mandibular palp vestigial (1-2 segments); telson apical spines long; eyes normally pigmented; peraeopods 5-7, bases subsimilar . . . . . *Tegano* Karaman & Barnard (Indo-Pacific).
—Mandiubular palp normally 3-segemnted, setose; telson sp[ines short; pigmented eyes small or lacking; peraeopods 5-7, bases strongly dissimilar. . . . . *Eriopisella* complex (p. 7)

8. Gnathopods 1 & 2 powerfully subchelate, raptoral (both sexes); peraeopods 5-7 slender, elongate; . . . . . *Carnarimelita* Bousfield (p. 7)
—Gnathopods 1 & 2 moderate, normally subchelate; peraeopods 5-7 not elongate . . . . . 9.

9. Eyes pigmented; peraeopods 5-7, bases nroadening posteriorly; pleon plate 3, hind corner acute; telson lobes bluntly rounded . . . . . *Netamelita* J. L. Barnard (p. 7)
—Pigmented eyes lacking; peraeopods 5-7, bases narrow; pleon plate 3, hind corner squared; telson lobes apically acute . . . . . *Anchialella* J. L. Barnard (Galapagos)

Aberrant members of the *Melita* subgroup, outside the study region, include *Josephella* Stock, 1988, and *Thalassostygius* Vonk, 1990. The *Allomelita* subgroup includes *Allomelita* Stock, 1980 (Type species -*A. pellucida* Sars) and is allied to the *Eriopisella* subgroup.

In the western north Pacific, the *Eriopisella* subgroup contains *Nippopisella nagatai* (Gurjanova, 1965), *N. propagatio* (Imbach, 1967), *Eriopisella sechellensis* (Chevreux), fide Nagata (1965), and *Netamelita* (?) sp. (Ishimaru, 1994). In the eastern North Pacific it contains *Netamelita cortada* J. L. Barn-ard, 1962. Extralimital genera of this group include *Indoniphargus* Straskrabe, 1967, *Micronipharqus* Schellenberg, 1934, and *Gininiphargus* Karaman & Barnard, 1979.

In the Asiatic North Pacific the *Eriopisa* subgroup contains *Victoriopisa ryukyuensis* Morino, 1991, and *Eriopisa elongata* (Bruzelius) fide Nagata (1965), a record questioned by Barnard & Barnard (1983). On the North American Pacific coast, *Psammogammarus garthi* (J. L. Barnard, 1952) is unrecorded north of southern California.

Carnarimelita Bousfield, 1989, to date contains only the monotypic species *C. janstocki*, endemic to anchialine habitats of the Hawaiian islands. The genus is unique in having gnathopod 1 of both sexes powerfully subchelate and raptorial and a loss (probably secondary) of sexual dimorphism in both gnathopods.

The *Rotomelita* subgroup encompasses *Rotomelita* J. L. Barnard, 1977, with the type species, *R. lokoa* Barnard, and R. ana Barnard from the Hawaiian islands; and the IndoPacific genera *Nainiloa* Karaman & Barnard, 1979; *Quadrus* Karaman, 1984; and *Tegano* Karaman & Barnard, 1982.

Abludomelita generic complex, new
(Fig. 1)

Melita Leach (part), Barnard & Barnard, 1983: 664.—Nagata, 1965: 293 (part).
Abludomelita G. S. Karaman, 1981: 39 (part).—Ishimaru, 1994: 49.

Type Genus. *Abludomelita* Karaman, 1981: 39.

Genera: *Desdimelita*, new genus. (p. 40); *Megamoera* Bate, 1862; *Melitoides* Gurjanova, 1934; *Quasimelita*, new genus (p. 36).

Diagnosis. Members of the *Abludomelita* subgroup differ from *Melita* (Leach) in the following character states: pleon segments 1-3 variously toothed postero-dorsally, or smooth; urosome segments 1 & 2 invariably with one or more dorsal teeth; gnathopod 1 (male), palm of propod and dactyl not modified, differing only slightly from female; coxa 6 (female) little or not sexually dimorphic, lacking hook-like antero-ventral lobe; and maxilla 2, inner plate variously with submarginal facial setae. They differ from species of *Dulichiella* in gnathopod 2 (male), in which the left and right propods are subequal in size and form, and not abnormally large, and in maxilla 1, inner plate, in which the inner margin is setose along inner margin rather than apically.

Taxonomic and distributional commentary. The species included in Karaman's original listing for the genus *Abludomelita* encompass most of those listed here under the five component genera of the complex (below).

The five component genera of the *Abludomelita* complex here recognized are keyed below, and principal diagnostic features are illustrated in figure 1. The pleon dorsum is strongly toothed in *Abludomelita* and *Megamoera,* weakly (or not) toothed in *Melitoides* and *Quasimelita* and smooth in *Desdimelita.* In gnathopod 1, the basis, carpus, and propod are strongly setose in *Melitoides* and *Quasimelita,* but relatively weakly setose in *Abludomelita, Megamoera* and *Desdimelita.* In gnathopod 2, the carpus is short and deep in *Abludomelita, Melitoides* and *Desdimelita,* but relatively elongate and shallow in *Megamoera* and *Quasimelita.* The propodal palmar margin is most strongly toothed in *Melitoides* and *Quasimelita,* less so in *Aludomelita,* and least in *Megamoera* and *Dentimelita.* The dactyl is heaviest, .smoothest, and distally bluntest in *Abludomelita,* intermediate in *Desdimelita,* but acutely tipped and strongly setose (outer margin) in *Megamoera, Melitoides* and *Quasimelita.* The inner plate of maxilla 2 bears a strong, deeply submarginal row of facial setae in *Abludomelita* and *Desdimelita*, less strong in *Megamoera,* and weakest and most closely submarginal in *Melitoides* and *Quasimelita.*

The 33 component species (of the 5 genera) are mainly littoral and sublittoral, in arctic and arctic boreal regions of the Arctic, North Atlantic, and North Pacific Oceans. A few species are bathyal and abyssal. The genus *Abludomelita* Karaman, sens. str., occurs in temperate and tropical littoral marine waters of the Mediterranean and western Indian Oceans. None penetrates mesohaline or fresh waters.

KEY TO NORTH PACIFIC GENERA OF THE *ABLUDOMELITA* COMPLEX

1. Pleosome segments 1-3 with postero-dorsal teeth; urosome segment 1 with 3+ posterodorsal teeth . . 2.

—Pleosome segments 1-3 lacking postero-dorsal teeth; urosome segment 1 often or usually with single stout postero-dorsal tooth .. . . . . 3.

2. Pleon segments 1-3, postero-dorsal tooth with single accessory tooth (on none) on each side; gnathopod 2 (male), dactyl heavy, broad, distally blunt, outer margin nearly smooth; telson lobes, spines deeply subapical, not set in lateral notches; maxilla 2, inner plate with strong submarginal or oblique facial row of setae . . . . . .*Abludomelita* Karaman (p. 9)

—Pleon segments 1, 2 & 3, postero-dorsal tooth with two or more accessory teeth; telson lobes, spines closely subapical, set in lateral notches; gnathopod 2 (male), dactyl attenuate, apex acute, outer margin variously setose; maxilla 2, facial setae closely submarginal or reduced . . . . . .*Megamoera* Bate (p. 15)

3. Uropod 3, outer ramus 1-segmented; pleon plate 3, hind corner rounded or squared. . . . . .*Melitoides* Gurjanova (p. 33)

—Uropod 3, outer ramus 2-segmented; pleon plate 3, hind corner variously produced, acute . . . . . 4.

4. Gnathopod 2 (male), dactyl strongly setose; ibid, carpus broader than deep . . .*Quasimelita* n. g. (p.36)

—Gnathopod 2 (male), dactyl lacking outer marginal setae; ibid, carpus narrow, deeper than broad . . . . . .*Desdimelita* n. g. (p. 40)

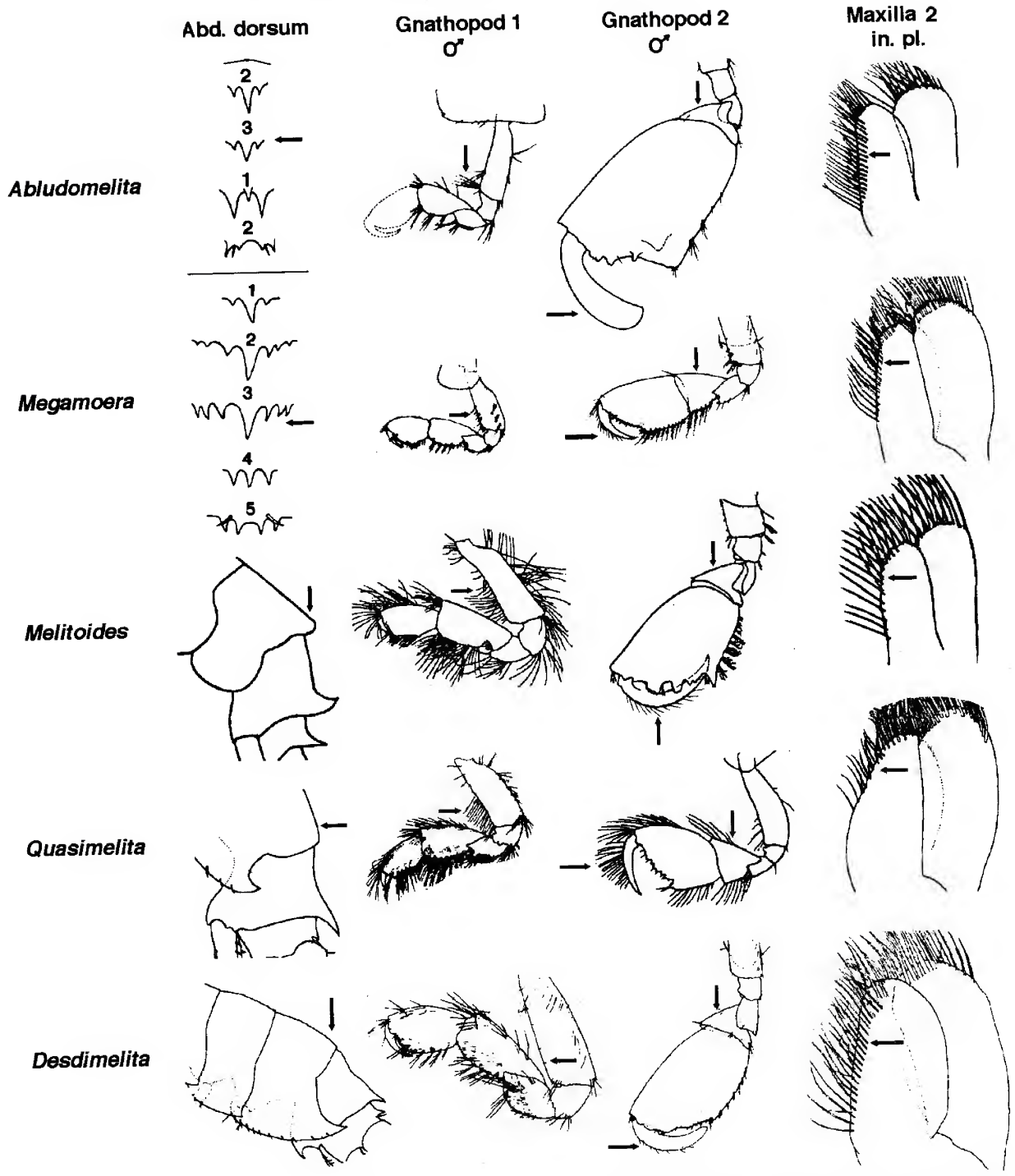

FIG. 1. CHARACTER STATES WITHIN THE *ABLUDOMELITA* COMPLEX OF GENERA.

Abludomelita Karaman (sens. str.)

Abludomelita Karaman, 1981: 39.—Karaman, 1982: 246.

Type species. *Melita gladiosa* Bate, 1862: 346.

Species. *Abludomelita obtusata* (Montagu, 1813); *A. aculeata* (Chevreux, 1911); *A. excavata* (Ledoyer, 1974); *?A. macheira* (K .H. Barnard, 1940).
North Pacific species: *Abludomelita somovae* (Bulycheva, 1952); *A. unamoena* (Hirayama, 1987). *A. denticulata* (Nagata, 1965); *?A. japonica* (Nagata, 1965); *?A. tenuicornis* (Stimpson, 1856) (nomen nudum).

Species incertae sedis: *?A. richardi* (Chevreux, 1900); *?A. solada* J. L. Barnard, 1961.

Diagnosis. Head, inferior antennal sinus simple, squarish. Antenna 1, peduncular segment 3 short. Pleon segments 1- 3, dorsal posterior tooth with single accessory teeth

(if present); pleon 3, dorsal teeth often weak or lacking. Urosome segment 1 with single dorsal posterior tooth. Urosome 2 with paired dorso-lateral cusps, each astride single spine.

Upper lip rounded below. Lower lip, inner lobes small, low, but distinct. Mandible, spine row strong, with 7-10 blades; right lacinia 3-dentate; palp weak, segment 2 usually shorter than 3; segment 1 often large, lacking cusp. Maxilla 1, outer plate with 9 apical spines; inner plate triangular, inner distal margin setose; palps dissimilar, segment 1, lateral setae weak or lacking, segment 2 little expanded, apex (right maxilla) with short spines. Maxilla 2, inner plate, inner face with strong (20-30) oblique or distally submarginal row of setae. Maxilliped, palp segment 2 columnar; dactyl stout.

Coxae 1-3 with hind marginal cusp; coxa1 broadened distally; coxa 4 antero-distally broadest, not deeper than coxa 3. Gnathopod 1 little or not sexually dimorphic; propod expanding distally, dactyl normal, unmodified. Gnathopod 2 (male), carpus short, deep; propod large, broadening distally, postero-distal angle produced or toothed, palm strongly toothed, hind margin with few (3-5) setal clusters; dactyl heavy, distally broad, outer marginal setae very weak or lacking, tip closing in groove between median facial spine cluster and postero-distal angle. In female, propod usually broadening distally; outer margin of dactyl smooth.

Peraeopods 3 & 4 normally slender, 3 larger; dactyls medium strong. Peraeopods 5-7, bases regular, hind lobes distinct, that of 5 little shorter than 6 & 7; segment 4 of peraeopod 6 longer than in 5 or 7; dactyls medium strong.

Pleon plate 3, hind corner usually produced, acute, upper and/or lower margins serrate. Pleopods normal, peduncles not setose. Uropod 1, rami subequal, longer than peduncle. Uropod 2, rami longer than peduncle, outer ramus the shorter, apices spinose. Uropod 3, inner ramus, apex often acute, outer ramus 2-segmented, not elongate, terminal segment distinct.

Telson lobes separated to base, each narrowing distally to acute apex; distal spine clusters deeply subapical, notches evanescent, inner marginal spines lacking.

Coxal gills large, gill 6 only slightly the smallest.

Taxonomic and distributional commentary. This taxonomically restricted group is confined to the Mediterranean region and northwestern Indian Ocean (Madagascar). Two somewhat aberrant members reach the western North Pacific. Component species exhibit a mixture of relatively apomorphic and plesiomorphic character states within the *Abludomelita* complex of genera (fig. 39, p. 64).

The genus *Abludomelita* sens. str. is warm-temperate-tropical in biogeographic affinities, and mainly littoral-sublittoral in depth range. It contrasts markedly with the other 5 generic components whose members are essentially arctic-boreal and boreal in thermal affinities and littoral-sublittoral to deep slope and abyssal in depth range. Members of northern genera have not yet been recorded from anti-boreal regions of the southern hemisphere, however.

"Melita" richardi Chevreux is placed here provisionally because of its dorsal abdominal teeth and dentition of pleon plate 3. Mouthparts & other critical characters of that species are undescribed. Similarly, *M. amoena* is placed here, but pleon plate 2, hind corner, is also acutely produced (fig. 8).

Western Pacific species of *Abludomelita* Karaman. Material of *Abludomelita* spp. from the western North Pacific region was not examined during the present study. However, published descriptions of that fauna are sufficiently detailed to confirm the overall correctness of previous assignments to the genus *Abludomelita* Karaman, 1981. Character state differences have been noted in earlier work and herewith, and these may yet prove significant at supraspecific taxonomic levels.

The type species of *Abludomelita, A.gladiosa* (Bate, 1862), is illustrated in figure 2. Other Mediterranean regional species, e.g., *A. aculeata* (Chevreux) and *A. obtusata* (Montagu) are similar in the following character states:

Pleon segments 1-3 dorsally dentate; urome segments 1 & 2 dorsally dentate; pleon plate 3, hind margin with accessory denticles; maxilla 2, inner plate with distinct deeply submarginal facial row of setae; gnathopod 1 very weakly or not sexually dimorphic; gnathopod 2 (male), carpus short, deep; propod large, distally broadening, with strongly toothed palm, and heavy blunt-tipped, weakly (or not) setose dactyl. Moreover, the head sinus is relatively broad, squarish, and the outer ramus of uropod 3 is relatively short and weakly spinose marginally.

By contrast, species of *Abludomelita* from the Sea of Japan (below) differ in some of these features, and in others, as noted below.

Abludomelita unamoena (Hirayama)
(Fig. 3)

Melita unamoena Hirayama,1987: 7, figs. 225-226.— Ishimaru, 1994: 51.

Taxonomic commentary. *Abludomelita unamoena* differs from Mediterranean regional species in the narrow propod of gnathopod 2 (female) and the unproduced apices of the telson lobes. Except for the dorsally toothed pleosome, several character states (of mouthparts, pleon plates and uropods) are similar to those of *Desdimelita* n. g. (p. 39). Its similarity to *Megamoera amoena* (Hansen), noted by Hirayama (loc. cit.), appears largely convergent.

Abludomelita somovae (Bulycheva)
(Fig. 4)

Melita somovae Bulycheva, 1952: 226, fig 25.—Barnard & Barnard, 1983: 666.
Abludomelita somovae (Bulycheva) Karaman, 1981: 41.

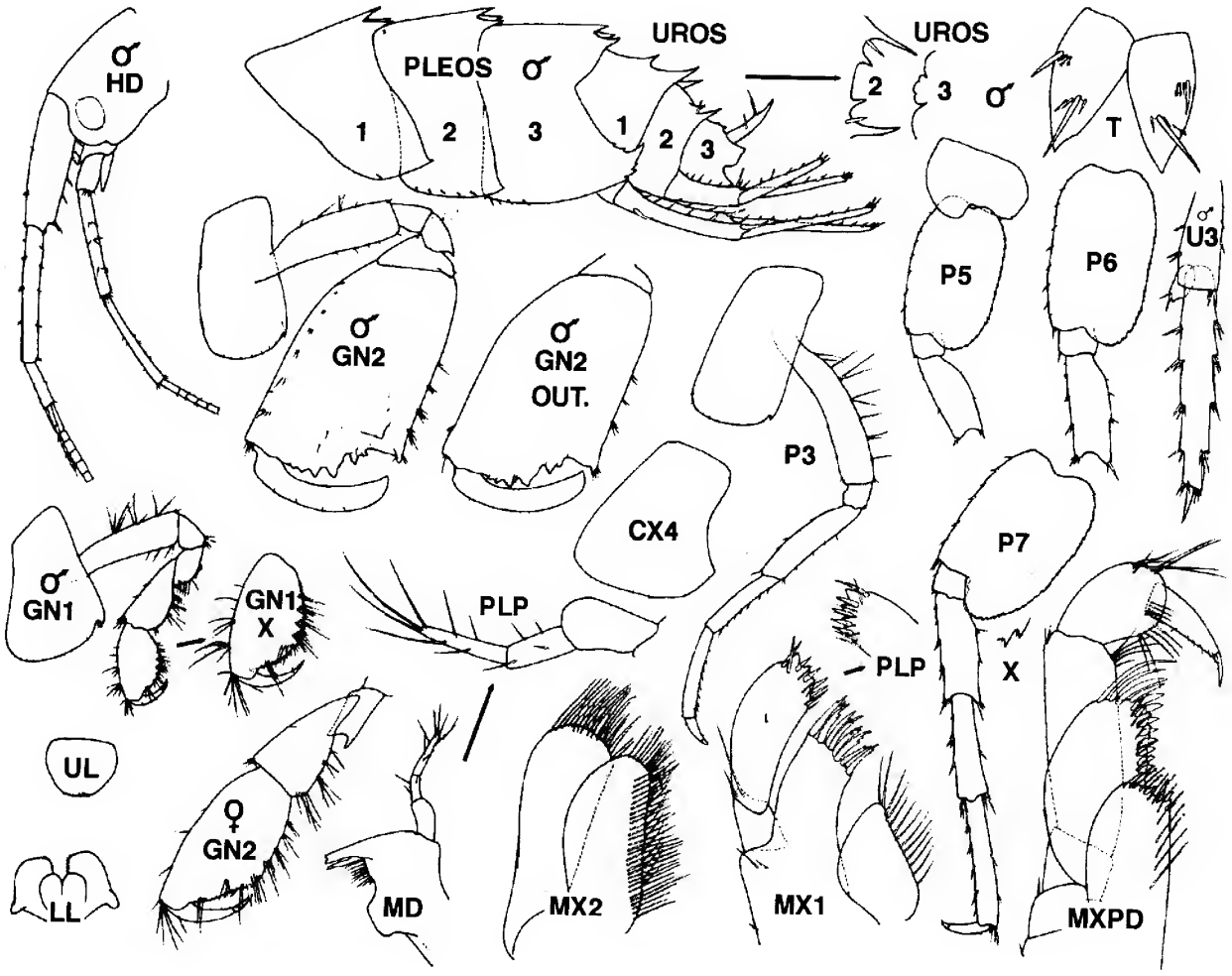

Fig. 2. *Abludomelita gladiosa* (Bate, 1862). Mediterranean Sea. Male (8.0 mm); female (6.0 mm).

Taxonomic commentary. *A. somovae* is similar to *A. unamoena* in the relatively weak dorsal pleonal teeth, and the strong oblique row of facial setae of the inner plate of maxilla 2. The weakly toothed pleon, weakly sexually dimorphic gnathopod 1, and unproduced apices of the telson lobes of *Abludomelita somovae* also trend to those of *Desdimelita,* n. g., endemic to the North American Pacific region.

Abludomelita japonica (Nagata)

Melita japonica, Nagata, 1965: 298, fig. 30.—Barnard & Barnard, 1983: 665.—Hirayama, 1987: 7.
Abludomelita japonica (Nagata) Karaman, 1981: 41.—Ishimaru, 1994: 49.

Taxonomic commentary: Although retaining the dorsally toothed pleosome of *Abludomelita* Karaman sens. str., *A. japonica* shows features of *Desdimelita,* n. g. (p. 39) in the slightly sexually dimorphic gnathopod 1, as well as similarity to *D. desdichada* (Barnard) in peraeopods, uropods, and telson noted previously by Nagata (loc. cit.). The mouthparts have not yet been described.

Abludomelita denticulata (Nagata)

Melita denticulata Nagata 1965: 293, fig. 27.—Barnard & Barnard, 1983: 664.—Hirayama, 1987: 7.
Abludomelita denticulata (Nagata) Karaman, 1982: 41.—Ishimaru, 1994: 49.

Taxonomic commentary: The female of this species conforms generally with Karaman's definition of the genus but differs from the Mediterranean regional type species in its 1-segmented accessory flagellum, and the unproduced apices of the telson lobes. The mouthparts, and gnathopods 1 & 2 of the mature male, have not been described. Lack of setae on the outer margin of the dactyl of gnathopod 2 is inconsistent with other genera of the *Abludomelita* complex.

We may conclude from the consistent differences (above) that Asiatic species of *Abludomelita* are transitional to features of *Desdimelita* of the North American Pacific region. Such differences may prove subgenerically, or perhaps fully generically distinctive, following more detailed examination of fully adult material of all species concerned.

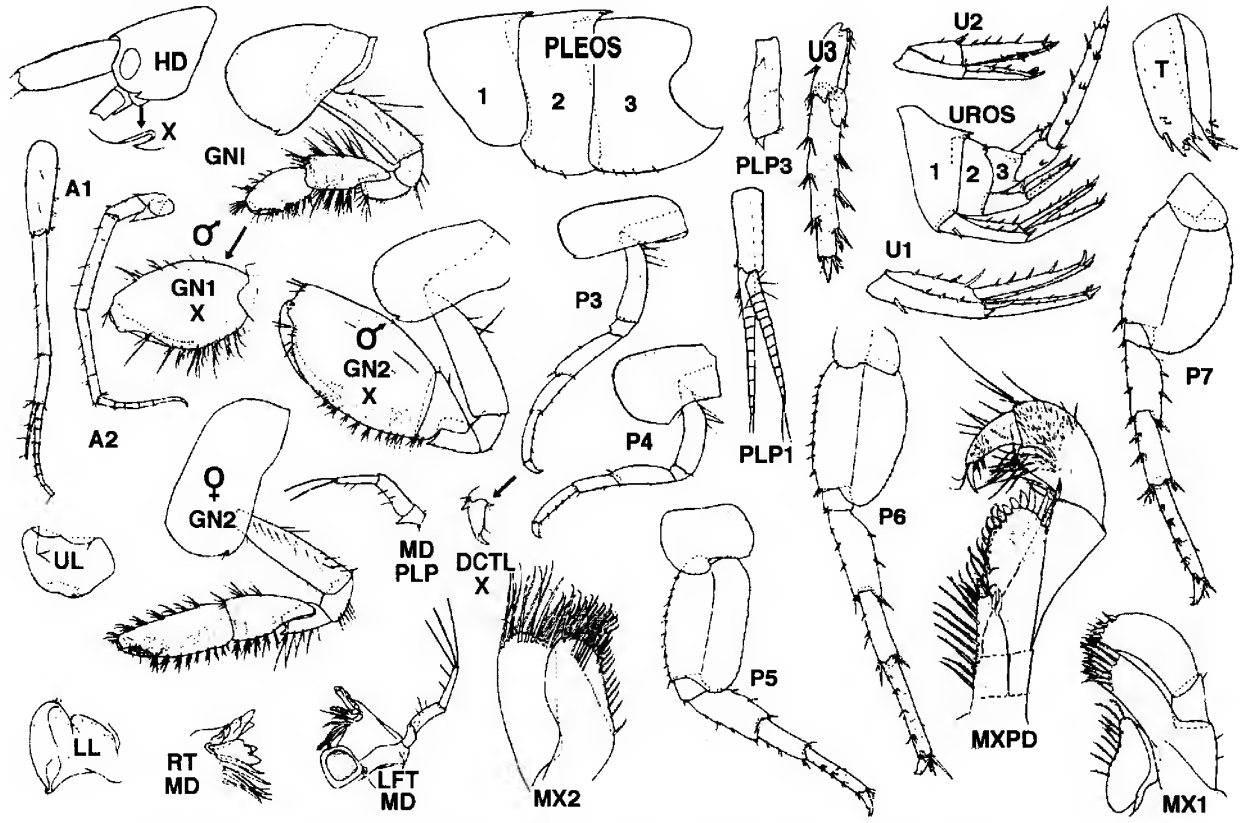

FIG. 3. ***Abludomelita unamoena*** **(Hirayama, 1987). Tomioka Bay, Japan. Male (5.25 mm); female (5.0 mm). (after Hirayama, 1987).**

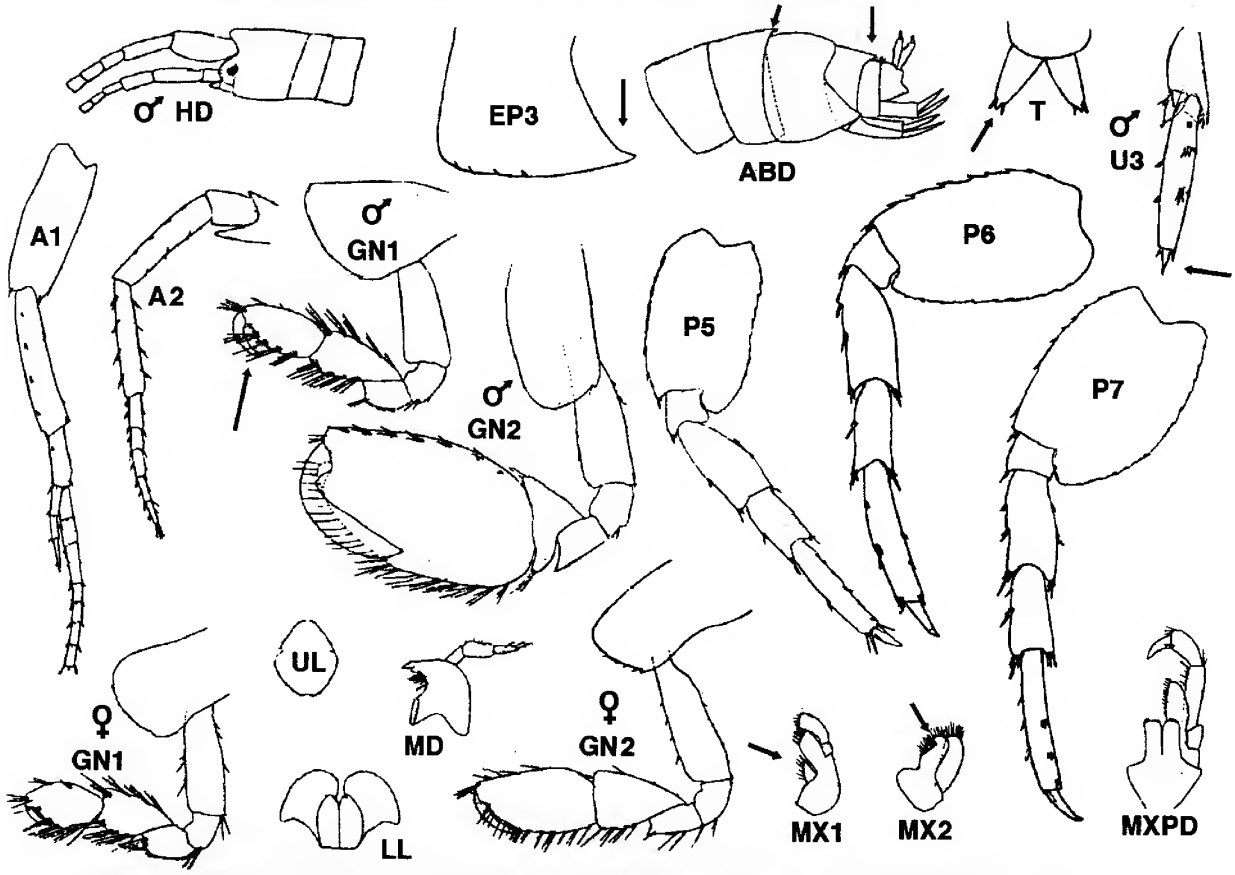

FIG. 4. ***Abludomelita somovae*** **(Bulycheva, 1952). Peter-the-Great Bay, Japan Sea. Male (5.6 mm); female (5.0 mm). (After Buulycheva, 1952).**

Dulichiella Stout, 1912

Dulichiella Stout, 1912: 140.—Karaman & Barnard, 1979: 152.—Barnard & Barnard, 1983: 667.—Ishimaru, 1994: 49.
Melita Stebbing, 1906: 421 (part).—Barnard, 1962: 105 (part).—Barnard, 1969a: 245 (part).—Barnard, 1972a: 67.

Type species. *Dulichiella spinosa* Stout, 1912: 140.

Species. *Dulichiella anisochir* (Kroyer, 1845); *D. australis* (Haswell, 1879); *D. cotesi* (Giles, 1890); *D. exilis* (F. Muller, 1864); *D. grandimana* (Chevreux, 1908); *D. pilosus* (Dana, 1852); *D. setipes* (Dana, 1852); *D. valida* (Dana, 1852).

Taxonomic commentary. Species differences in *Dulichiella* are shown mainly in the palmar toothing and dorsal pleonal armature. Species from the waters of Japan (Kyushu and southern Honshu) have been recorded as *D. appendiculata* by Hirayama and Kikuchi (1979) and Hirayama (1986), and as *D. fresneli* by Irie and Nagata (1962) and Nagata (1965) (see below). On re-examination, these materials will very probably prove new to science, distinct from the species originally described from subtropical and warm temperate parts of the western and eastern North Atlantic Ocean as were *M elita appendiculata* by Say (1812) and as *M. fresneli* by Audouin (1826), respectively.

In many taxonomic features, especially of dorsal armature, mouthparts, gnathopods and telson, this genus closely resembles *Abludomelita* Karaman. In gnathopod 2 of mature males of both genera, the propod is very much enlarged, with a large medial socket into which closes the tip of the heavy baton-like dactyl, the whole presumably functioning as a percussive, sound-producing mechanism.

Dulichiella spinosa Stout

Dulichiella spinosa Stout, 1912: 140.—Karaman, 1981: 39.—Barnard & Barnard, 1983: 667, fig. 45.
Melita spinosa (Stout) Barnard, 1969a: 245.
Melita appendiculata (Say) Barnard, 1969b: 126
Melita fresneli (Audouin) Wailes, 1931: 41?

Material examined. *Dulichiella spinosa* Stout has not been recorded north of Goleta, California. It did not occur in present study material from central California northwards. The record of *Dulichiella fresnell* Audouin from British Columbia by Wailes, 1931, might be a synanthropic introduction but such has not been verified by Chapman (1988). The record remains problematical.

Dulichiella appendiculata (Say)
(Figs. 5, 6)

Melita appendiculata (Say, 1818): 374.—Barnard, 1971: 67, fig. 32A?.—Hirayama & Kikuchi 1979: 68, figs. 1-6?.—Barnard & Barnard, 1983: 667, fig. 45.—Hirayama, 1986: 35?—Austin, 1985: 609?—Ishimaru, 1994: 49?

Diagnosis. Pleon segment 1-3 dorsally toothed and mucronate, weakly setose. Urosome segments 1-3 toothed dorsally and segemnt 3 dosro-laterally. Head lobe broadly rounded, with squared inferior notch. Antenna slender, setose. Antenna 1 slightly longest; peduncular segment 3 short; accessory flagellum distinct.

Upper lip slightly emarginate. Lower lip, inner lobes strongly developed. Mandible, molar strong, with molar flake; spine row strong; palp strongly setosae, 3-segmented, segment 1 with cusp. Maxilla 1, inner plate acute, attenuated distally, with basal and apical setae; outer plate 9-spinose; palp segment 2 expanded; segment 1 with shoulder setae. Maxilla 2, inner plate shorter, with strong facial row. Maxilliped, outer plate short, narrow; palp 2 columnar; dactyl and segment 3 heavy.

Coxal plates relatively shallow, decreasing posteriorly; coxa 4 not excavate behind. Coxae 2 broader than 3. Gnathopod 1 (male), propod and dactyl regular, unmodified. Gnathopod 2, right side similar to gnathopod 1 and female; left gnathopod, propod & dactyl grossly enlarged; palm with 2-3 large outer marginal teeth; dactyl distally stout, rounded tip closing on concavity of strongly and oblique process at posterior palmar angle.

Peraeopods 3 & 4 regular, setose, dactyls short. Peraeopods 5-7, bases not expanded, sublinear; segment 6 slightly broadening distally, hind margin with strong setal clusters; dactyls medium, with outer tooth or cusp.

Pleon plates 1 & 2, hind corners acumninate; plate 3, hind corner produced, acute. Pleopods, rami slender. Uropods 1 & 2, rami relongate, sublinear, >peduncle. Uropod 3, inner ramus small; outer ramus sublinear, strongly spinose, terminal segment distinct.

Telson lobes divergent, apices sharply acute.

Distribution. Tropical and warm-temperate, coastal marine regions of the Indo-Pacific, including Hawaii, and the central Atlantic region. Occurs mainly in high salinity (outer) portions of estuaries, often associated with sponges and corals, and occasionally on *Macrocystis* holdfasts (Barnard, 1969b).

Taxonomic commentary. In many taxonomic features such as the facial setae of maxilla 2, and the form of the propod and dactyl of gnathopod 2 (male), *Dulichiella* closely resembles *Abludomelita* (see phenogram, fig. 39, p. 64).

A previous literature record of *Melita appendiculata* from the B. C. region has been queried by Austin, 1985. This species has also not been recorded by Chapman (1988) among species introduced to the North Pacific region, and likewise remains problematical for the study region. Summer surface temperatures in the Strait of Georgia are presumably sufficiently high, but winter temperatures and summar salinities may be too low to ensure survival of such a warm-temperate species that is native to warm salt estuaries of the southeastern United States.

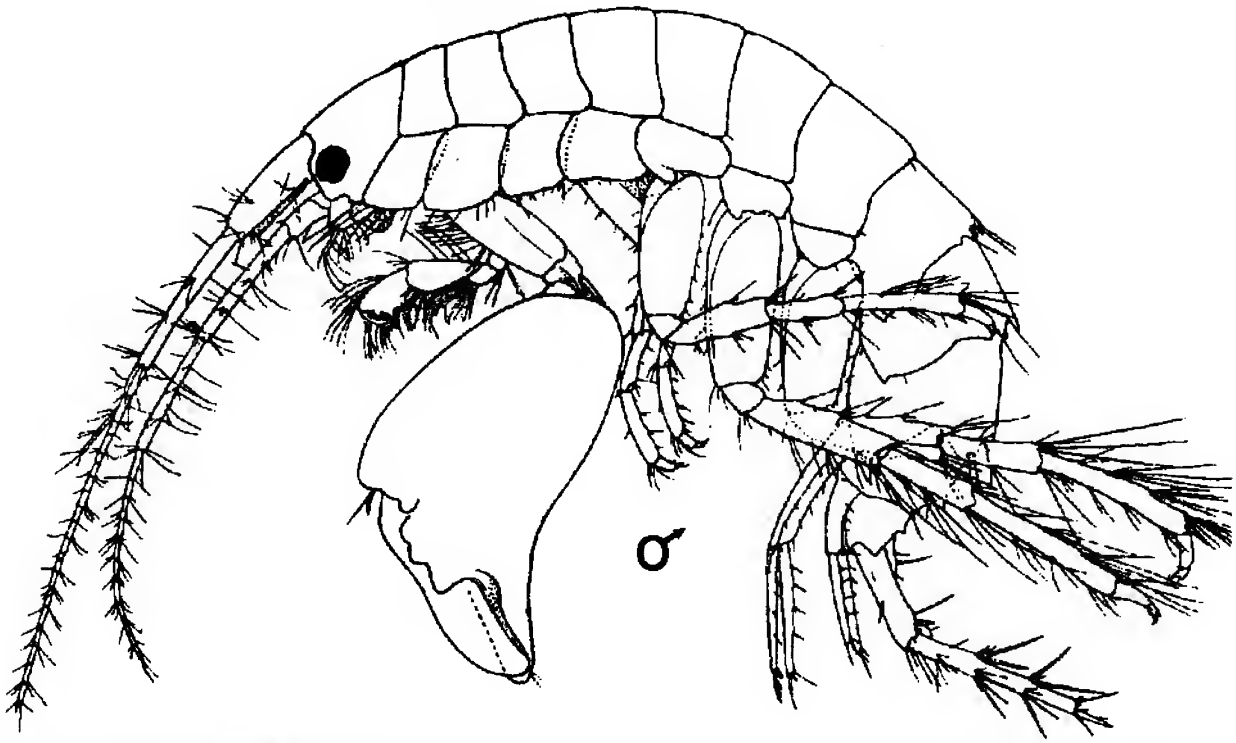

FIG. 5. *Dulichiella appendiculata* (Say). North American Atlantic. Male (After Barnard, 1971).

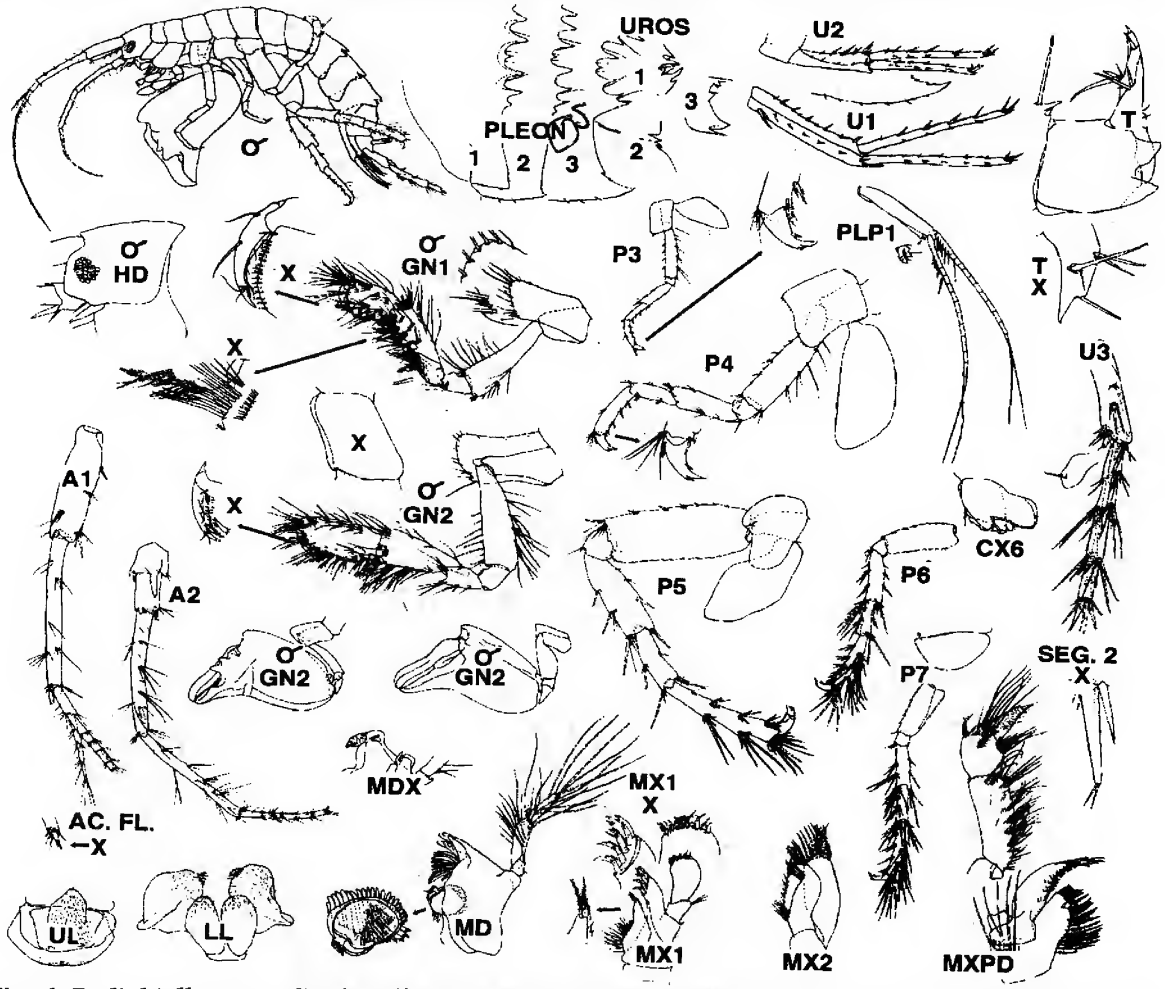

Fig. 6. *Dulichiella appendiculata* (Say) Tomioka Bay, Japan. Male (7.5 mm); female (6.0 mm). (after Hirayama & Kikuchi, 1979)

Megamoera Bate (revived status)

Megamoera Bate, 1862: 225.
Melita Stebbing, 1906: 425 (part).—Gurjanova, 1951: 738 (part).—Barnard, 1969a: 245 (part).—Barnard & Barnard, 1983: 663(part).
Abludomelita Karaman, 1981: 40 (part)?

Type species. *Gammarus dentatus* Kroyer, 1842: 530 (selected J. L. Barnard, 1969: 245).

North Pacific Species: *M. subtener* (Stimpson, 1864) (p 20); *M. bowmani*, new species (p. 22); *M. rafiae*, new species (p. 22); *M. unimaki*, new species (p. 25); *M. glacialis*, new species (p. 27); *M. borealis*, new species (p. 27); *M. mikulitschae* (Gurjanova, 1953) (p. 30); *M. kodiakensis* (J. L. Barnard, 1964) (p. 32); *Megamoera amoena* (Hansen, 1887) (p. 17).

Other species. *Megamoera pallida* (G. O. Sars, 1879); *Megamoera? lignophila* (J. L.Barnard, 1961).

Diagnosis. Pleosome segments 1-3, postero-dorsal tooth usually present,usually with two or more accessory teeth on each side. Urosome segment 1, postero-dorsal tooth usually with 1-3 accessory teeth on each side. Urosome 2 with dorso-lateral pairs of teeth each astride single spine. Head, anterior head lobe rounded, lower margin often with small accessory process; inferior antennal sinus narrowly notched. Antennae regular, antenna 2 much shorter than antenna 1.

Mouthparts regular. Upper lip shallowly notched. Lower lip regular, inner lobes well developed. Mandible, spine row with numerous blades (8-14); left lacinia 4-dentate, right lacinia 4-5 dentate; palp segment 3 usually longer than 2; segment 1 short, with acute medial process. Maxilla 1, inner plate triangular, tip not attenuated, inner margin 6-14 setose; outer plate with 9 apical spines; palp segment 1 usually with strong lateral setae; segment 2 moderately expanded distally. Maxilla 2, inner plate, facial setae variously reduced, closely marginal or submarginal. Maxilliped, outer plate medium large; palp segment 2 slightly broadened; dactyl medium.

Coxae 1-4 medium to shallow, 1-3 cuspate behind. Coxa 1 variously expanded distally; coxa 4 excavate behind, not deeper than 3. Gnathopod 1 small, weakly sexually dimorphic; basis, antero-distal setae variously developed; carpus elongate, shallow; propod relatively narrow, shorter than carpus, palm and dactyl slightly modified; in female, posterior margin of dactyl often denticulate or microsetose. Gnathopod 2 (male), carpus generally short, hind lobe narrow, deep,apex (margin) setose; propod large, slightly broadening distally, palm oblique, usually toothed, with distinct hinge tooth, inner face with submarginal postero-distal spine cluster, posterior margin strongly setose (5-10 clusters); dactyl variously setose anteriorly, tip attenuated; in female, carpus relatively long but much shorter than propod, medium deep; propod relatively large (smaller than in male), slightly narrowing distally, palm regularly convex, with postero-distal tooth.

Coxa 6 (female), anterior lobe shallow, often subequally bifid. Peraeopod 4 slightly smaller than 3. Peraeopod 5, basis not grossly smaller than in 6 & 7; in all, bases regularly expanded, hind lobes normal; segment 4 slightly broadened; distal segments regular; dactyls typically medium short.

Pleon plates 1 & 2, hind corners squarish or acuminate, rarely produced; pleon plate 3, hind corner usually produced, acute, upper and lower margins not serrate. Uropod 1, peduncle with disto-lateral spine; rami sublinear, spinose, often shorter than peduncle. Uropod 2, rami shorter than peduncle, outer ramus the shorter. Uropod 3, outer ramus not elongate, terminal segment distinct. Telson lobes regular, separated almost to base, marginal spines subapical, set in lateral and medial notches.

Coxal gills 2-5 large, 6 often distinctly smallest. Brood plates sublinear, short.

Taxonomic and distributional commentary. *Megamoera* encompasses about a dozen arctic and subarctic species, extending southwards in the North Pacific region mainly along the North American coast.

Barnard (1969a) resurrected *Gammarus dentatus* Kroyer, 1942 as the type of *Megamoera* Bate, 1862, that had long been synonymized within *Melita* Leach, 1814. Restriction of the generic name *Melita* to species of the *palmata* type, by Karaman (1981), renders Bate's generic name available for species of the *dentata* type, as herein diagnosed.

The generic status of *Melita lignophila* J. L. Barnard, 1961, from Gulf of Panama deeps, and the Asiatic North Pacific species *Melita japonica* Nagata, 1965 are uncertain. several characters, especially of the mouthparts, have apparently not been described nor figured. In both species, the dorsal abdominal dentition is unlike that of other species of *Megamoera* (e.g., pleon segment 1 lacks dorsal teeth, and urosome segment 1 lacks lateral denticle(s)). Barnard (loc. cit.) noted the resemblance of *M. lignophila* to *M. richardi* (Chevreux, 1900) which, because of the serrated margins of the hind process of pleon plate 3, is here related more closely to *Abludomelita* Karaman, 1981, sens. str. In *M. japonica*, the propod of gnathopod 1 is distinctly sexually dimorphic and, in the male, more slender and longer than the carpus. The mouthparts, peraeopods, uropods, etc., have not been described in detail, but generally likened to those of other members of the Asiatic variant of *Abludomelita* (see above, p. 11). Pending more detailed information, therefore, "*Melita*" *lignophila* is not treated further, nor included in the key to species of *Megamoera* (p. 16).

Melita amoena Hansen, 1888, from sublittoral depths of the Greenland Sea is included here and in the key (p. 16) because of comparison with *Megamoera unamoena* by Hirayama, 1987, from the western north Pacific, and as a probable member of the genus *Megamoera*.

KEY TO NORTH PACIFIC SPECIES OF *MEGAMOERA*

1. Pleon segments 1-3 each armed postero-dorsally with stout median tooth and 2 lateral denticles on each side; telson lobes, proximal subapical notch located on inner (medial) margin; gnathopod 1 (male), propod subovate, palm very oblique, merging with hind margin ..... 2.
—Pleon segments 1-3 with unlike combinations of median and lateral accessory denticles; telson lobes, proximal subapical notch located on outer (lateral) margin); gnathopod 1 (male) propod broadest distally, palm usually steep or nearly vertical, sharply angled from posterior margin ..... 3.

2. Peraeopods 6 & 7, bases large, length (depth) >1.5x basis of peraeopod 5; coxa 1 expanded distally; telson lobes with 2 inner marginal spines ..... *M. glacialis* n. sp. (p. 27)
—Peraeopods 6 & 7 bases regular, length <1.5 X basis of peraeopod 5; coxa 1 not broadening distally; telson lobes lacking inner marginal spines ..... *M. borealis* n. sp. (p. 27)

3. Pleon plate 1, postero-dorsal marginal teeth minute or lacking; pleon plate 3, hind corner squarish; uropod 1, outer ramus distinctly shorter than inner ..... *M .kodiakensis* (Barnard) (p. 31)
—Pleon plate 1, postero-dorsal maginal teeth distinct; pleon plate 3, hind corner variously produced, acute, uropod 1, rami closely subequal ..... 4.

4. Gnathopod 2 (male), anterior margin of dactyl with a few weak setae; maxilla 1, palp segment 1 with few (1-3) lateral setae; maxilla 2, inner plate, with strong submarginal row of facial setae ..... 5.
—Gnathopod 2 (male), anterior margin of dacty strongly setose; maxilla 1, palp segment 1 with (5+) lateral setae; maxilla 2, inner plate, facial setae reduced, marginal in position ..... 7.

5. Pleon segments 1 & 2 , central postero-dorsal tooth with 4 fine denticles on each side; urosome 1, mid-dorsal tooth with 2 fine denticles on each side; telson, apical spines long. *M. subtener* (Stimps.) (p. 20)
—Pleon segments 1 & 2, central tooth with 2-3 stout lateral teeth on each side; urosome 1, mid-dorsal tooth with single stout lateral tooth on each side; telson, apical spines short ..... 6.

6. Telson with 1 long apical spine; gnathopod 1 (male), propod, palm short, very oblique; dactyl with basal expansion or swelling ..... *M. rafiae* n. sp. (p. 22)
—Telson with 2 long apical spines; gnathopod 1 (male), propod, palm normal, nearly vertical; dactyl normal, slender, little expanded basally ..... *M. bowmani* n. sp. (p. 22)

7. Pleon segment 3 with postero dorsal tooth and 5 denticles on each side; pleon plate 3, hind corner acute but little produced; coxa 4 broad, as deep as coxa 3, lower margin horizontal; head with distinct lower marginal process. ..... *M. mikulitschae* (Gurjanova) (p. 30)
—Pleon segment 3 with postero-dorsal tooth and 1-3 denticles on each side, or lacking entirely; pleon 3, hind corner strongly produced, acute; coxa 4 normal, not deeper than coxa 3, lower margin oblique; anterior head lobe, lower margin simple ..... 8.

8. Pleon segment 3, postero-dorsal teeth minute or lacking; urosome 1, dorsal tooth lacking lateral denticles; gnathopod 2 (male), palm with several strong teeth ..... *M. amoena* (Hansen) (p. 17)
—Pleon segment 3 with conspicuous postero-dorsal tooth and lateral denticles; urosome 1 with dorsal tooth and lateral denticle; gnathopod 2 (male), palm weakly toothed or with hinge tooth only ..... 9.

9. Pleon segments 1 & 2, postero-dorsal tooth with 1-3 lateral denticles on each side; telson, apical spines long; uropod 3, proximal segment of outer ramus slender, with 5-6 clusters of marginal spines ..... *M. dentata* (Kroyer) (p. 17)
—Pleon segments 1 & 2 each with single postero-dorsal tooth; telson, apical spines short; uropod 3, proximal segment of outer ramus regular, margins each with 4-5 spine clusters .. *M. unimaki* n. sp. (p. 25)

Megamoera dentata (Kroyer)
(Figs. 7, 9)

Gammarus dentatus Kroyer, 1842: 530, fig. 29.
Megamoera dentata (Kroyer) Bate, 1962: 225. t. 39, fig. 4.
Melita dentata (Kroyer) Sars, 1895: 513, pl. 181, fig. 1.—Stebbing, 1906: 427.—Gurjanova, 1951: 740, fig. 518.—Shoemaker, 1955: 49.—Barnard, 1969b: 126.—Bousfield, 1973: 65, pl. IX.1.—Karaman, 1981: 43 (+ synonymies).—Barnard & Barnard, 1983: 664.—Ishimaru, 1994: 50 (part)?

Material Examined.
ALASKA: Unimak Island, P. Slattery coll., June-October, 1982. - 1 female br. I (15.0 mm). CMN collections, Ottawa.

Diagnosis. Female br. I (15.0 mm). Pleon segments 1-3 with centre tooth and 1-3 lateral denticles on each side; pleon 3 with centre tooth and 3 denticles. Urosome segment 1 with central tooth and1-2 lateral denticles; urosome 2 with 2 pairs of short teeth and single spines. Anterior head lobe strongly rounded, lower margin smooth, inferior notch small. Eye rounded, small to medium. Antenna 1, peduncular segment 3 short; accessory flagellum 4-5-segmented; flagellum ~35-segmented. Antenna 2, flagellum short, little longer than peduncular segment 5, 18-segmented.

Mandible, spine row with 10-12 blades; palp, terminal segment with 8-10 setae. Maxilla 1, inner plate with 15 marginal setae; palp segment 1 with 2 lateral setae. Maxilla 2, facial setae of inner plate reduced (12-15), distal, closely submarginal. Maxilliped, inner plate with 8 inner marginal setae; outer plate with 6 merging curved spines and 2 outer setae; dactyl, long, straight.

Coxa 1 not expanded distally, anterior margin sharply rounded. Coxa 4 relatively narrow, lower margin convex, oblique, antero-distally sharply rounding. Gnathopod 1, propod short, nearly as deep as long, palm gently convex, nearly vertical; dactyl finely serrate along inner margin. Gnathopod 2, propod subrectangular, longer and broader than carpus, palm oblique, nearly straight, weakly toothed, 2/3 length of hind margin; dactyl, outer margin strongly setose.

Peraeopods 3-4 unequal, dactyls medium. Peraeopods 5-7, bases regular, hind margins finely crenulate; dactyls medium.

Pleon plates 2, hind corner acuminate; pleon 3, hind corner moderately produced, acute. Uropods 1 & 2, rami elongate, strongly spinose, tips extending beyond peduncle of uropod 3, outer ramus shorter. Uropod 3, outer ramus slender, margins with 5-6 clusters of short spines; terminal segment short, length about twice basal width.

Telson lobes slender, diverging distally, fused basally; lateral and medial subapical notches about equidistant from apices; subapical and inner marginal spines medium length; inner marginal spine(s) short.

Coxal gill 6 markedly shorter and narrower than gill 5. Brood plates slender, medium.

Male (to 28 mm). Gnathopod 1, basis antero-distally weakly setose; carpus relatively long and shallow with distinct, setose lower margin; propod shorter, expanding distally, palm long; dactyl regular, lacking proximal bulge. Gnathopod 2, carpus relatively long, medium deep, lower margin distinctly setose; propod large, subrectangular, slightly broadening distally, palm oblique, with strong hinge tooth, hind margin wtih 10-12 setal clusters; dactyl stout, apex blunt, outer margin with a few short setae.

Distributional Ecology. Widely distributed around arctic shores, extending south to Cape Cod in the western Atlantic, and to the northern Sea of Japan in the western N. Pacific.

Common on rocky and sedimentary bottoms, at littoral to sublittoral depths.

Taxonomic commentary. The type species shows considerable variation in material from Europe, eastern North America, and the Bering Sea. However, the number of dorsal teeth on pleonal and urosomal segments compares closely with that of similar sized females from Hudson Bay, Canadian Arctic, and from Spencer I., Nova Scotia.

Megamorea amoena (Hansen)
(Fig. 8)

Melita amoena Hansen, 1887: 147.—Stebbing, 1906: 426.—Gurjanova, 1951: 750, fig. 519.—Barnard & Barnard, 983: 664.

Diagnosis. Male (8.5 mm): Pleon segments 1 & 2 with 1 and 5 very small postero-dorsal teeth respectively; segment 3 unarmed. Urosome segment 1 with 2 small dorsal teeth; urosome 5 with 2 minute dorsal teeth. Antenna 2, peduncular segments 4 & 5 subequal. Coxae 1-4 relatively narrow and shallow. Gnathopod 2, carpus very short, small, lobe narrow; propod very large, broadening distally, palm oblique, convex, strongly but irregularly toothed; outer margin of dactyl with several setae.

Peraeopods 5-7, bases very broad, hind margins convex, finely crenulate, hind lobes distinct; dactyls short. Pleon side plates 2 & 3, hind corners acute, produced. Uropods 1 & 2, rami relatively short, extending little beyond peduncle of uropod 3. Uropod 3, outer ramus 1-segmented.

Taxonomic and distributional commentary. Regrettably, the mouthparts, telson, coxal gills and brood plates have not been described. The species exhibits character states of *Quasimelita* and *Melitoides*, but in balance, it is best retained within *Megamoera* until further study.

This species was taken intitially from off East Greenland at a depth of 56 m., has not been recorded at shelf depths from the North Pacific study region.

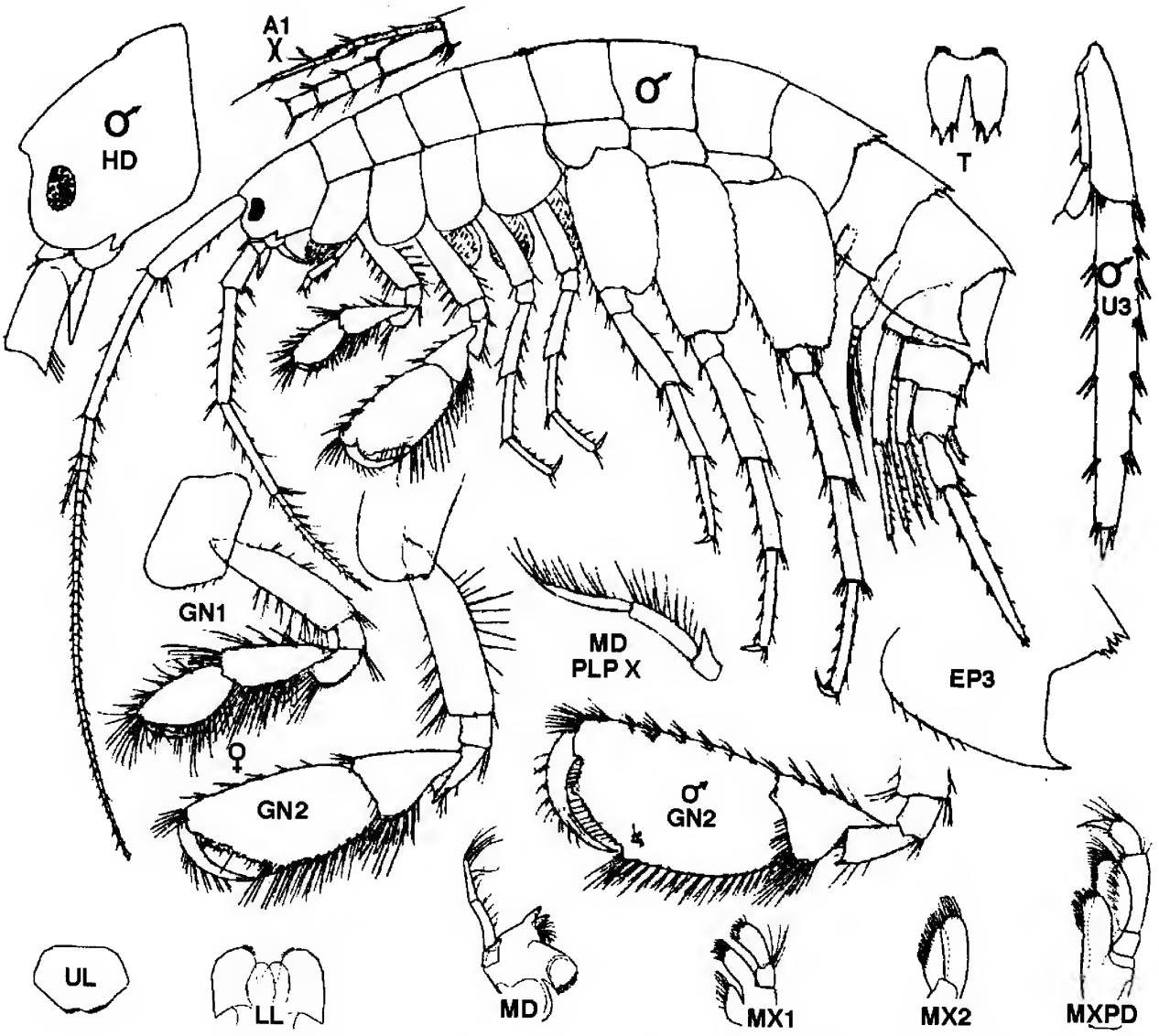

Fig. 7. ***Megamoera dentata*** **(Kroyer, 1842). Norwegian Sea. Male (16.0 mm); female (12.0 mm). (after Sars, 1895).**

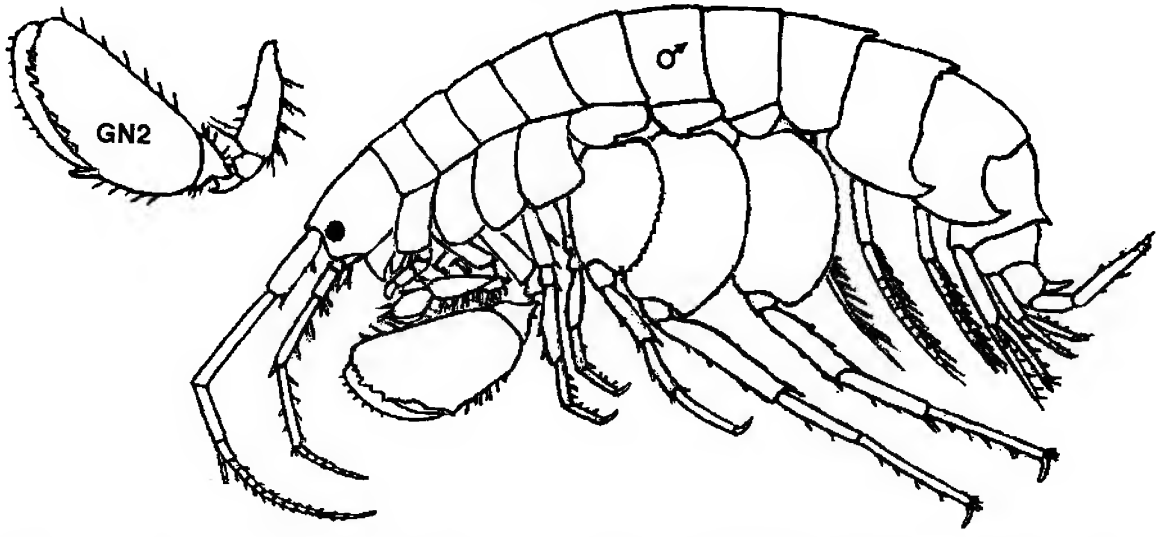

Fig. 8. ***Megamoera amoena*** **(Hansen, 1887). Greenland Sea. Male (8.5 mm) (after Gurjanova, 1951).**

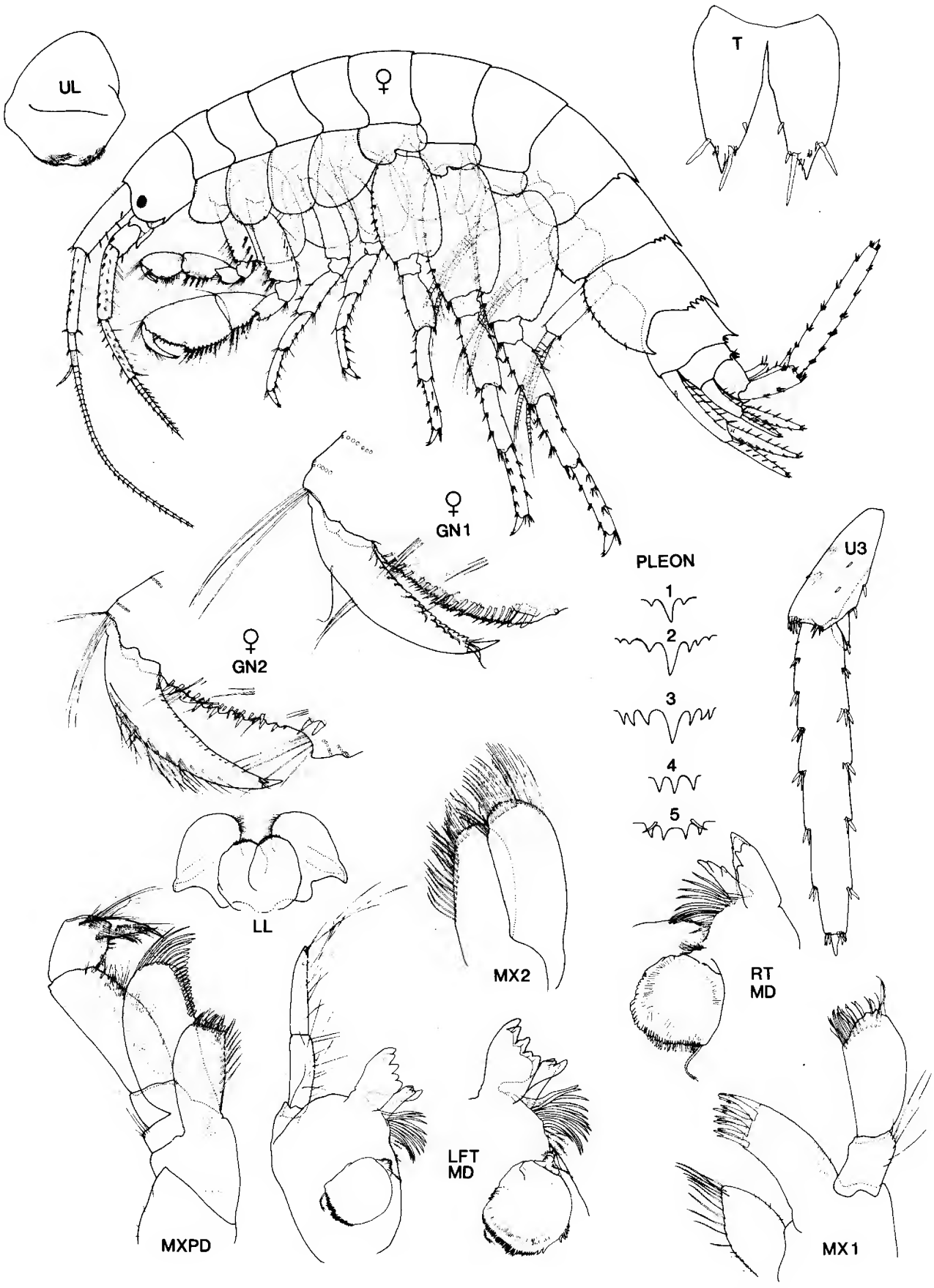

Fig. 9. ***Megamoera dentata*** **(Kroyer, 1842) Unimak I., Female (15.0 mm).**

Megamoera subtener (Stimpson)
(Fig. 10)

Gammarus subtener Stimpson 1864: 167.—Stebbing, 1906: 742.— Shoemaker, 1955: 49.
Abludomelita subtener (Stimpson) Karaman, 1981: 40.
non *Melita dentata* (Kr.) Shoemaker, 1955: 49.—Barnard, 1958: 57.—Barnard, 1969b: 126.—Austin, 1985: 610.—Staude, 1987: 384.

Material Examined. More than 500 specimens at 81 stations, as follows:
ALASKA:
Southeastern Alaska, ELB Stns., 1961: A 30 (Murder Cove) - male (12.0 mm) (figured specimen); also 19 other localities, intertidal to 10 m. - ~350 specimens, incl. males, females, juveniles.

BRITISH COLUMBIA:
Queen Charlotte Islands, ELB Stns., July-August, 1957, 11 stations (incl. E9, E14, E17, E18, E24, E25 H8b, H11, W3a, W4b), intertidal to 30 m. depth - 8 males, 8 females, 2 juveniles.
North-central mainland coast, ELB Stns., July, 1964: N16 (Port Neville), intertidal - 1 female; 12 other localities, intertidal to 24 m. - 16 males, 16 females, 45 juveniles.
Burrard Inlet, ELB Stn. E4 (Roche Pt)., Nov. 4, 1977, 8 m., sand - 1 juvenile.
Vancouver Island, north end, ELB Stns., July, 1959: 6 localities (V3, V7, V11, V17, V19, V21), intertidal to 65 m. - 1 male, 4 females, 4 juveniles.
Vancouver Island, south end, ELB Stns., August,1955: P2 (Tofino Pt.), intertidal - 1 female, 2 juveniles.
ELB Stns., July, 1970: P712 (David I., Trevor Channel) - 1 female ov. (10.0 mm (figured specimen); 4 other localities, intertidal, bedrock and sand - 5 males 4 females, 3 juveniles.
ELB Stns., August, 1975: 3 localities (P17a, P22, P25), intertidal to 30 m., sand, shell, stones - 12 female, few juveniles.
ELB Stns., June-July, 1976: 5 localities (B4, B10c, B10d, B11b, B26), intertidal to 35 m., sand, sandy mud - 28 specimens, mostly juveniles.
ELB Stns., May, 1977: B4a (Piper's Lagoon), intertidal and subtidal, stones and boulders - 2 juveniles; B13 (Trevor Channel), 6-14 m., hard sand - 2 males.
Saanich inlet, K.E.Conlan Stn II014, 5 m. - 1 female; Stn. II061, 4 m. - 2 males, 1 female; Stn. II062, 5 m. - 9 males and females.

WASHINGTON: ELB Stn., Friday Harbor, 1966 - 13 specimens including males, females, juveniles.

OREGON: ELB Stns., 1966: W64 (Netart's Bay), intertidal, coarse sand, gravel, shells - 13 males, females.

Diagnosis. Male (12.0 mm). Pleon segments 1 & 2 with centre tooth and 4-6 lateral denticles on each side; pleon 3 with centre tooth and 3 denticles. Urosome 1 with central tooth and paired lateral denticles. Urosome 2 with 2 pairs of short teeth and single spines. Anterior head lobe shallow, lower margin with prominent accessory process. Eye round, medium. Antenna 1, accessory flagellum 6-segmented; flagellum ~35-segmented. Antenna 2, flagellum slender, 18-segmented.

Mandible, spine row with 10-12 blades; palp segment 3 not strongly setose (10-12 setae). Maxilla 1, inner plate with 15 marginal setae; palp segment 1 with 2 lateral setae. Maxilla 2, facial setae of inner plate numerous (30+), in medial submarginal row. Maxilliped, inner plate with 8 inner marginal setae; outer plate with 6 merging curved spines and 2 outer setae; dactyl, long, straight.

Coxa 1 distally broadened, anterior margin broadly rounded. Coxa 4, lower margin convex, oblique, antero-distally sharply rounding. Gnathopod 1, basis antero-distally weakly setose; propod relatively short, deep, palm distinct, smooth, oblique; dactyl with weak proximal bulge. Gnathopod 2, carpus, hind lobe narrow, apex weakly setose; propod large, subrectangular, slightly broadening distally, palm oblique with low median and dactylar teeth, hind margin with 10-12 setae clusters; dactyl stout, apex blunt, outer margin with a few short setae.

Peraeopods 3-4 unequal, dactyls medium. Peraeopods 5-7, bases regular, hind margins crenulate; dactyls medium.

Pleon plates 1 & 2, hind corners acuminate; pleon 3, hind corner moderately produced, acute. Uropods 1 & 2, rami elongate, strongly spinose, tips extending beyond peduncle of uropod 3. Uropod 3, outer ramus stout, margins with 5-6 clusters of longish spines; terminal segment distinct, length 3-4 X basal width.

Telson lobes slender, diverging distally, fused basally; proximal notch positioned laterally; apical, subapical and inner marginal spines long.

Coxal gill 6 slightly shorter than gill 5.
Female ov. (10.0 mm). Head sexually dimorphic, female with single inferior marginal tooth. Gnathopod 1, propod short, little longer than deep, palm nearly vertical. Gnathopod 2, propod longer and more slender than carpus, tapering distally, palm oblique, nearly straight, length 2/3 that of hind margin; dactyl with 6-8 outer marginal setae. Brood plates slender, short.

Distributional ecology. From Prince William Sound and southeastern Alaska, through British Columbia, Washington, and Oregon to central California. Habitat: outer surf coast, LW level to subtidal, under stones and kelp.

Taxonomic and distributional commentary. This species cannot really be confused with *M. dentata* because of character states of the head region and others outlined in the key. The correctness of its synonymy with *M. dentata*, by the authors above, is therefore seriously in question . No other species, superficially like *M. dentata*, ranges from British Columbia into the Central California coast.

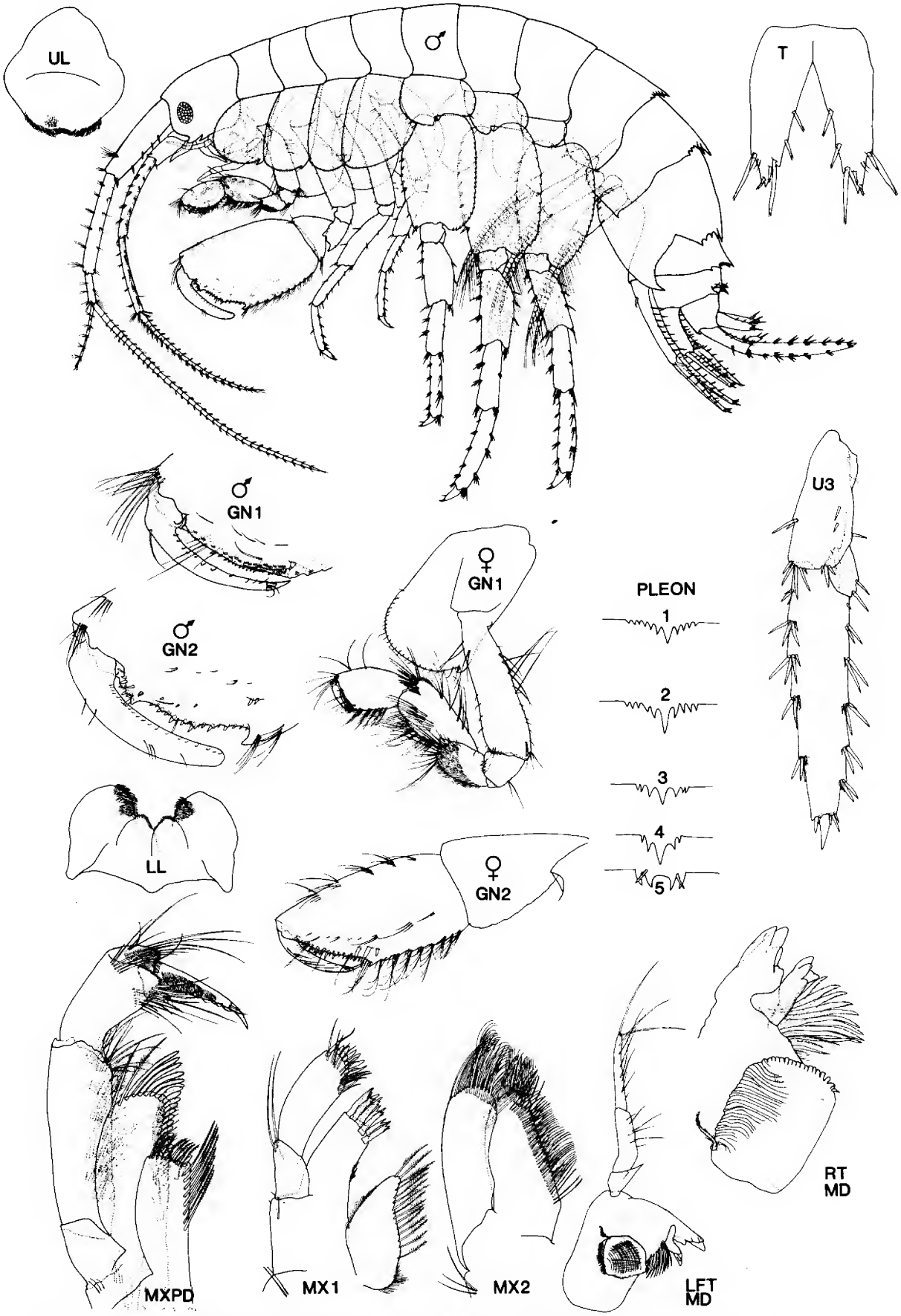

Fig. 10. ***Megamoera subtener*** **(Stimpson, 1864). Male (12.0 mm). Murder Cove (A30), Allaska. Female (10.0 mm).. David I. (P712), Trevor Channel, B. C.**

Megamoera rafiae, new species
(Fig. 11)

Material Examined:
ALASKA:
Southeastern Alaska, ELB Stns., 1961: A30 (1 male); A48 (Scraggy I.) - male (12.0 mm) **Holotype**; female ov. (10.0 mm) **Allotype**; 50 male, female juvenile **Paratypes**; A30 (Murder Cove) - 1 male; A75 (anterior part of body?). CMN collections, Ottawa.

Diagnosis. Male (12.0 mm). Pleon segments 1 and 2 with low centre tooth and 1-2 strong lateral denticles on each side. Pleon 3 with 3 strong lateral denticles on each side, each about equal in size to centre tooth. Urosome 1 postero-dorsally subequally tridentate; urosome 2 subequally quadridentate. Anterior head lobe shallow, rounded, lower margin with subacute process; inferior antennal notch short, slit-like. Eye medium, round. Antenna 1, peduncular segment 3 medium; accessory flagellum 5-segmented; flagellum ~40-segmented. Antenna 2, flagellum medium, tapering, ~12-segmented.

Mandible, spine row with ~12 blades; palp segment 3 with 9-12 mostly medium setae. Maxilla 1, inner plate with 12 inner marginal plumose setae; palp segment 1 with 3 lateral setae. Maxilla 2, facial setae of inner plate numerous (30+), in medial submarginal row that diverges slightly distally. Maxilliped, inner plate with ~15 inner marginal setae; outer plate, apex subtruncate, with 5 apical curved spines and 3 long setae; dactyl gently curved.

Coxa 1 expanded distally, broadly rounding anteriorly. Coxa 4 narrow, nearly smoothly rounded below. Gnathopod 1, basis with few antero-distal setae; propod small, more slender and shorter than carpus; palm convex, shallowly oblique, almost merging with hind margin, row of bifid spines on either side of palmar margin; dactyl with distinct basal bulge. Gnathopod 2, carpus, hind lobe relatively narrow, lower margin with 2-3 setal groups; propod subrectangular, with 6-8 lower marginal setal clusters, palm convex, weakly toothed; dactyl normal distally attenuated, inner margin finely setulose.

Peraeopods 3 & 4 regular, 4 smaller; dactyls very short. Peraeopods 5-7, bases regularly broadened; dactyls very short, length of each about twice its basal width.

Pleon plates 1 & 2, hind corners blunt; hind corner of plate 3 weakly produced, length ~ basal width. Uropods 1 & 2, rami short, not exceeding peduncle of uropod 3; outer ramus shorter. Uropod 3, outer ramus medium, lateral margins with 4 clusters of short spines; terminal segment small, length about twice its basal width.

Telson lobes stout, little diverging, proximal notch lateral; lateral and medial spines short, medial spine longest.
Coxal gill 6 somewhat the shortest, but relatively broad.

Female (10.0 mm). Head sexually dimorphic, female with single inferior marginal toot. Gnathopod 1, propod short, shallow, subrectangular, palm nearly vertical; dactyl ordinary. Gnatho-pod 2, carpus short, propod relatively stout, little longer than deep, not narrowing distally, deeper than carpus; palm normally oblique, length nearly equal to posterior margin, postero-distal angle with 2 stout spines. Coxa 6, anterior lobe weakly bifid. Brood plates relatively broad.
Colour: The head is grey, mottled with white; the anterior head lobe is white, the eye dark. Peraeopods 5-7 are slightly banded distally.

Etymology. Named in honour of Fahmida Rafi, biologist, formerly with the National Museum of Natural Sciences, Ottawa, in recognition of her long-term assistance in the collecting, sorting, and identification of the North Pacific materials of this study.

Distribution. Taken under stones and boulders at the LW level of rocky shore habitats, at 3 stations in the high boreal region of southeastern Alaska.

Taxonomic commentary. This species is closely similar to *M. bowmani* (below) that is distributed from Southeastern Alaska to North-central British Columbia. However, it differs in characters of the key (p. 16) and in addition, coxa 1 is less strongly broadened, coxa 4 is more broadly rounded below, and the dorsal abdominal teeth are less strong.

Megamoera bowmani, new species
(Fig. 12)

Material Examined.
ALASKA:
Southeastern Alaska, ELB Stns., June-July, 1961: A30 (Murder Cove), intertidal - 2 males; A75 (Kayak Pt.) - 6 males 10 juveniles; A131 (Renard I.) - 2 juveniles.
ELB Stns., July, 1980: S5B1 (NW Hogan I.) - 5 males, 2 female, 7 juveniles.

BRITISH COLUMBIA:
Queen Charlotte Islands: ELB Stn. H3 (mouth of Masset Harbour), Aug. 27, 1957, 2-22m. - male (11.0 mm) **Holotype**; female subad. (7.0 mm) **Allotype;** 14 male, 8 juvenile **Paratypes;** ELB Stns. H3 (22), and H 11(1).

Diagnosis. Male (11.0 mm). Pleon segment 1 with one mid-dorsal tooth and single weak laterals; pleon 2 with low mid-dorsal and 3 weaker lateral denticles on each side; pleon 3 with 3 denticles on each side. Urosome 1 postero-dorsally subequally tridentate. Urosome 2 subequally quadridentate. Anterior head lobe shallow, rounded, inferior margin with distinct acute process; inferior antennal sinus a small sharp notch. Eye smallish, ovate. Antenna 1, peduncular segment 3 short; accessory flagellum 5-segmented; flagellum ~40-segmented. Antenna 2, flagellum tapering, distinctly longer than peduncular segment 5, ~12-segmented.

Mandible, spine row with ~12 blades; palp segment 3 with 8-9 longish setae. Maxilla 1, inner plate with 12 inner marginal plumose setae; palp segment 1 with 2-3 lateral

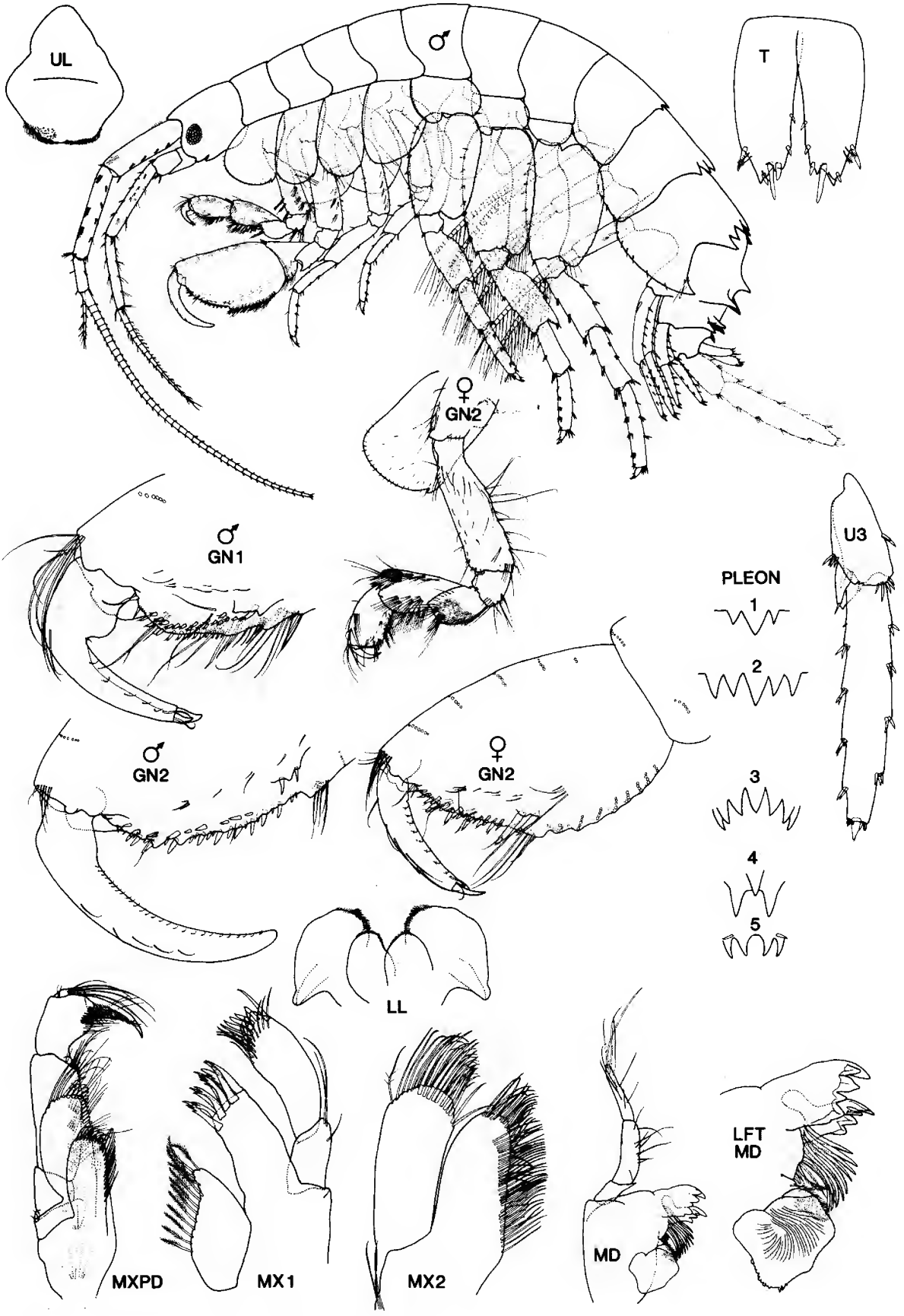

Fig. 11. ***Megamoera rafiae*****, new species. Scraggy I. (A48), Alaska. Male (12.0 mm); female (10.0 mm).**

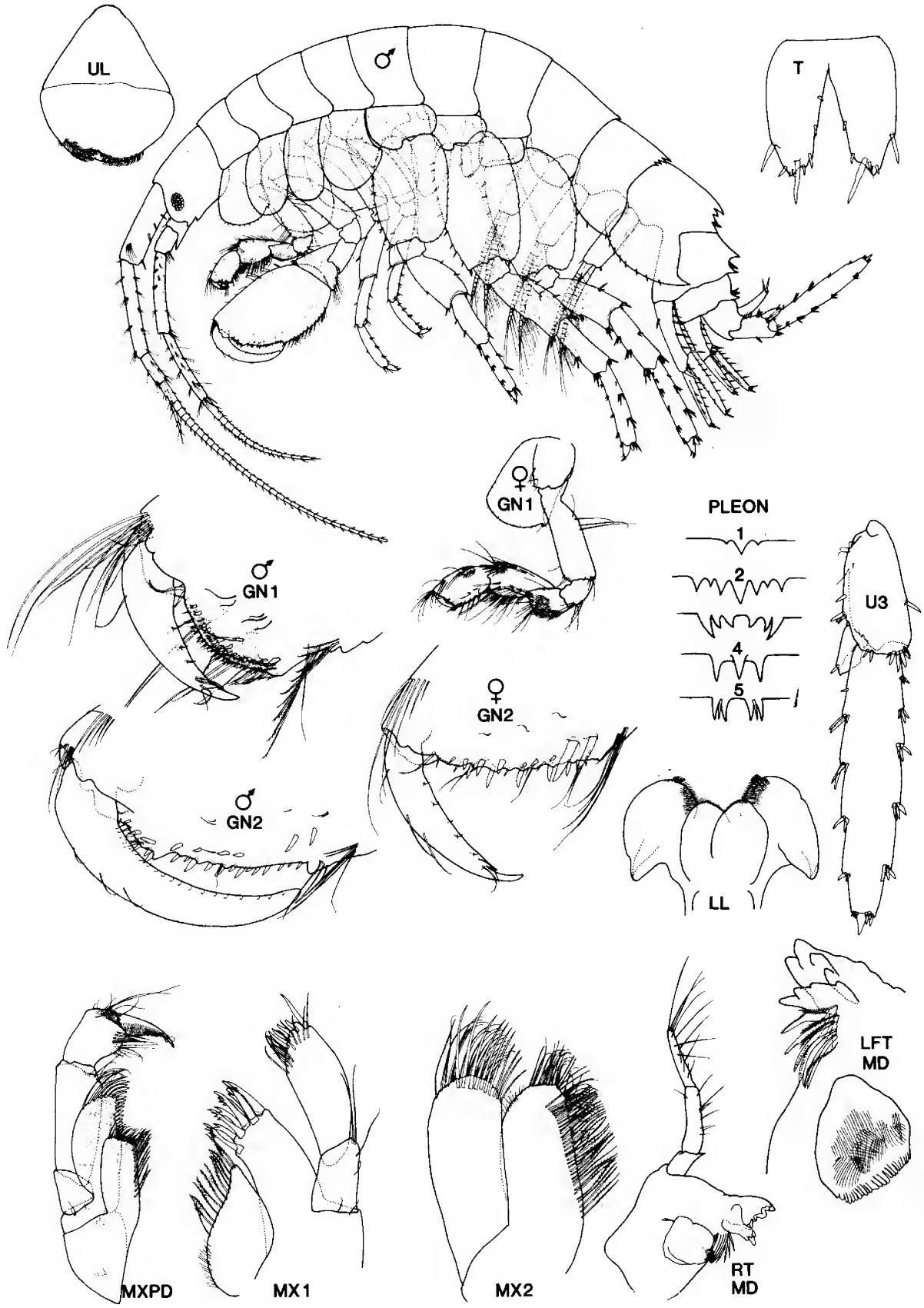

Fig. 12. ***Megamoera bowmani,*** **new species. Off Masset Harbour (H3), Queen Charlotte Islands, B. C. Male (11.0 mm); female (7.0 mm)..**

setae. Maxilla 2, facial setae of inner plate numerous (30+), in distally diverging medial submarginal row. Maxilliped, inner plate with 13 inner marginal setae; outer plate, apex subtruncate, with 5 apical curved spines and 3 long setae; dactyl gently curved.

Coxa 1 not strongly broadened distally. Coxa 4 nearly smoothly rounded below. Gnathopod 1, basis weakly setose anter-distally; propod small, more slender and shorter than carpus; palm strongly convex, smooth, nearly vertical, row of bifid spinules on either side of margin; dactyl with slight basal bulge. Gnathopod 2, carpus relatively shallow, lower margin with ~4 clusters of setae; propod broad, lower margin with 10+ clusters of short setae; palm oblique, convex, with weak hinge tooth; dactyl regular, distally attenuated, outer margin nearly bare.

Peraeopods 3 & 4 normal, 4 smaller; dactyls very short. Peraeopods 5-7, bases large, slightly dissimilar; dactyls very short, length ~ basal width.

Pleon plates 1 & 2, hind corners slightly acuminate; pleon 3 weakly produced, tooth slightly longer than basal width; lower margin moderately spinose. Uropods 1 & 2, rami short, not exceeding peduncle of uropod 3. Uropod 3, outer ramus stout, lateral margins with 5 clusters of short spines; terminal segment short, length ~2X basal width.

Telson lobes stout, basally fused, little diverging distally, proximal notch lateral; apical, and medial marginal spines short; notch spines, medium long, slender. Coxal gill 6 short, relatively narrow.

Female subadult (7.0 mm). Gnathopod 1, propod short, shallow, subrectangular, palm nearly vertical; dactyl normal. Gnathopod 2, carpus relatively short; propod relatively stout palm normally oblique, very weakly toothed, length nearly equal to posterior margin, postero-distal angle with 2 stout spines. Coxa 6, anterior lobe entire (possibly bilobate in mature female).

Etymology. Named in honour of the late Thomas E. Bowman, Smithsonian Institution, Washington, D. C., whose extensive contributions to crustacean systematics embraced several major taxa, including the Amphipoda.

Distributional Ecology. Recorded from the southern part of southeastern Alaska, and the Queen Charlotte Islands, British Columbia, in slatey gravel and organic debris, from LW level to depths of 25 m.

Taxonomic commentary. *Megamoera bowmani* is very closely related to *M. rafiae,* as noted above (p. 22); both are most closely related to *M. subtener* (Stimpson) (p. 20).

Megamoera unimaki, new species
(Fig. 13)

Material Examined.
ALASKA: Aleutian Islands, Unimak I., P. Slattery Stn. C53-C56, June-oct., 1972 - female ov. (13.0 mm) **Holotype** ; 9 female **Paratypes;** Stn. C32 - 4 females, 2 juv.; Stn. C34 - 1 female; Stn. C37b - 1 female, few juv.; Stn. C39 - 1 female CMN collections, Ottawa.

Diagnosis. Female ov. (13.0 mm). Pleon segments 1 & 2 with small postero-dorsal tooth only; pleon 3 with centre tooth and single lateral denticle on each side. Urosome 1 with central tooth and single lateral denticle; urosome 2 with 2 pairs of unequal teeth and single spines. Anterior head lobe strongly rounded; lower margin smooth, inferior antennal sinus a short sharp notch. Eye medium-large, almond-shaped. Antenna 1, peduncular segment 3 short; accessory flagellum 5-segmented; flagellum 20-segmented. Antenna 2, flagellum slender, 9-segmented, subequal to each of peduncular segments 4 & 5.

Mandible, spine row with 14-15 slender blades; palp segment 3 moderately setose. Maxilla 1, inner plate with 20+ marginal setae; palp segment 1 with 5 lateral setae. Maxilla 2, facial setae of inner plate numerous (~25), in closely submarginal medial row, distally diverging. Maxilliped, inner plate with 15+ inner marginal setae; outer plate medial marginal short spines merging apically with 5-6 slender curved spines; dactyl nearly straight.

Coxa 1 little expanded distally, anterior margin sharply rounded. Coxa 4 little broadened, posterior excavation shallow, lower margin oblique, antero-distally sharply rounding. Gnathopod 1, basis antero-distally moderately setose; propod slender nearly as long as carpus, palm distinct, smoothly convex, steeply oblique, margins lined on both sides with many fine spinules, poster-distal angle with sub-marginal cluster of 6 small spines; dactyl strongly serrate behind. Gnathopod 2, carpus relatively short, deep, hind lobe with 6-8 setal clusters; propod relatively large, sub-rectangular, hind margin with 10-12 setal clusters; palm oblique, nearly straight, very weakly toothed; dactyl stout, distally tapering, outer margin strongly setose.

Peraeopods 3-4 slightly unequal, dactyls medium short. Peraeopods 5-7, bases increasing in width posteriorly, hind margins weakly crenulate; segment 4 slightly broadened; dactyls medium short. Coxa 6, anterior lobe shallow, simple.

Pleon plates 1 & 2, hind corners weakly acuminate; pleon 3, hind corner moderately produced, acute, tooth nearly twice length of its basal width. Uropods 1 & 2, rami medium, strongly spinose, tips about level with peduncle of uropod 3; uropod 1, disto-lateral spine strong. Uropod 3, outer ramus stout, margins with 5 clusters of short spines; terminal segment short, length little longer than basal width.

Telson lobes medium, not fused basally, diverging distally; proximal notches lateral, medial notches indistinct; apical, subapical and inner marginal spines short.

Coxal gill 6 markedly shorter and narrower than gill 5. Male unknown, probably of the *M. dentata* type.

Etymology. Named after the type locality on Unimak Island, Aleutian Islands, Alaska.

Distributional ecology. Known only from the type locality, under stones at LW level.

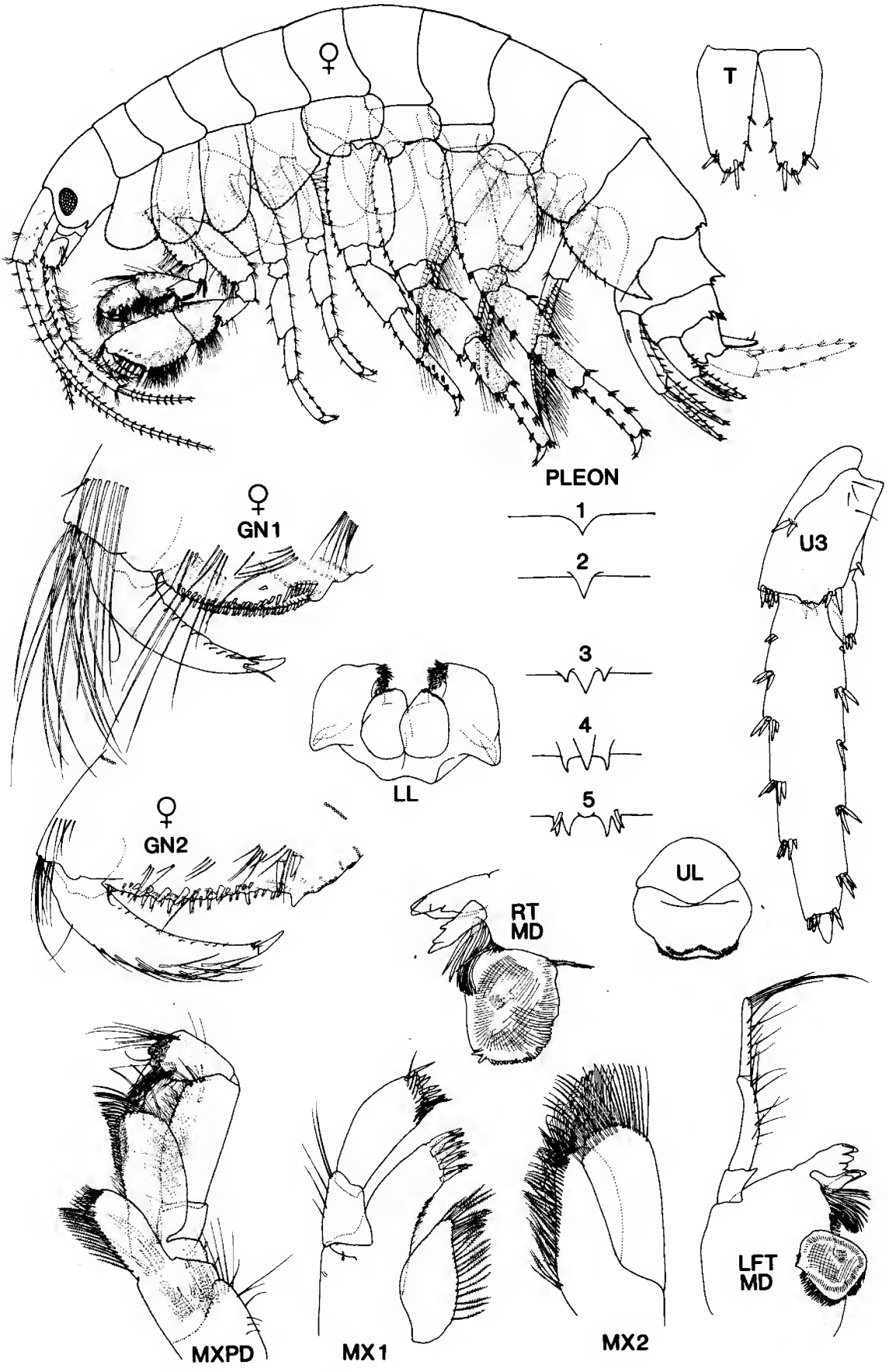

Fig. 13. ***Megamoera unimaki,*** **new species. Unimak I., Aleutian Islands, Alaska. Female (13.0 mm).**

Taxonomic commentary. *Megamoera unimaki* clusters taxonomically closest to *M. glacialis* and *M. kodiakensis*. However, in the serrated dactyl of gnathopod 1, position of facial setae of maxilla 2, etc., the female shows character states similar to those of the type species *M. dentata* (Kroyer).

Megamoera glacialis , new species
(Fig. 14)

Material examined.
ALASKA:
Aleutian Islands. Unimak I., P. Slattery Stns., June-Oct., 1982: C32 - 1 male; C39 - 1 male.
Southeastern Alaska. ELB Stns., July, 1961: A110 (College Fiord), intertidal - male (12.0 mm) **Holotype.**
ELB Stns, Aug. 1, 1980: S17B1 (Kalanin Bay), intertidal - 1 male. CMN collections, Ottawa.

Diagnosis. Male (12.0 mm). Pleon segments 1, 2 & 3 each with medium centre tooth and 2 lateral denticles on each side. Urosome 1 with central tooth and small single lateral denticles. Urosome 2 postero-dorsally with 2 pairs of short unequal teeth and single spines. Anterior head lobe shallow, lower margin with prominent accessory process, inferior sinus a shallow notch. Eye rounded, medium. Antenna 1, peduncular segment 2 slender, peduncle 3 short; accessory flagellum 4-segmented; flagellum elongate, ~35-segmented. Antenna 2, flagellum18-segmented, slightly longer than peduncular segment 5.

Mandible, spine row with 10-12 blades; palp segment 3 medium setose (10-12 long setae). Maxilla 1, inner plate with 13-15 marginal setae; palp segment 1 with 8-10 lateral setae. Maxilla 2, facial setae of inner plate reduced (7-10 setae), in distal medial closely submarginal row. Maxilliped, inner plate with 10 inner marginal setae; outer plate spines relatively slender, merging apically with 6-8 very slender curved spines; dactyl basally stout, straight, unguis curved.

Coxa 1 expanded distally, anterior margin broadly rounded. Coxa 4 relatively broad, lower margin convex, slightly oblique, antero-distally rounding. Gnathopod 1, basis antero-distally weakly setose; propod subovate, about equal in length to carpus, palm smooth, gently convex, very oblique, demarcated from longer hind margin by small tooth; dactyl with weak proximal bulge, inner margin setulose. Gnathopod 2, carpus, hind lobe narrow, distal margin with 2-3 weak setal clusters; propod large, subrectangular, posterior margin distally with 6-7 setal clusters, palm oblique, convex, with low irregular hinge tooth, and stout postero-distal tooth; dactyl stout, apex attenuated, without distinct unguis, outer margin strongly setose.

Peraeopods 3-4 unequal, dactyls medium. Peraeopods 5-7, bases regular, increasingly broad posteriorly, hind margins weakly crenulate; segment 4 narrow; dactyls medium.

Pleon plates 1 & 2, hind corners rounded or square; pleon 3, hind corner not produced, minutely acuminate. Uropods 1 & 2, rami elongate strongly spinose, tips extending beyond peduncle of uropod 3. Uropod 3, inner ramus very short; outer ramus relatively short, stout, margins with 3-4 clusters of medium short spines; terminal segment small, slender.

Telson lobes stout, diverging distally, weakly fused basally; proximal notch medial; notch spines medium long, stout; inner marginal spines short;

Coxal gill 6 much smaller than gill 5.

Female unknown, probably of the *M. unimaki* type; inferior head margin probably with single tooth., a sexually dimorphic feature of N. Americna Pacific members of this genus.

Etymology. From the Latin root "*glacialis*", meaning icy, in reference to the glacial ice floating in the fiord during summer months.

Distributional Ecology. Recorded from the Aleutian Islands, southern Bering Sea, to Prince William Sound, under boulders at LW level.

Taxonomic commentary. *Megamoera glacialis* is very similar to *M. borealis* (Fig. 40, phenogram) in character states of the mouthparts, pleon plate 3, and telson. It is readily distinguished however, by the more broadly expanded bases of peraeopods 5-7, the slightly weaker dorsal abdominal dentition, and the stouter uropod 3 with shorter marginal spines. The mature female is unknown.

Megamoera borealis, new species
(Fig. 15)

Material Examined.
ALASKA:
Aleutian Islands, Unimak I., P. Slattery Stn. 39, June-Oct., 1982 - 1 female ov. (10.0 mm).
Southeastern Alaska, ELB Stns., 1961: A83 (Cordova Bay) (3 males));A110 (College fiord) - male (8.0 mm) **Holotype**; female ov (9.5 mm) **Allotype**; 5 male. 2 female, 6 juvenile **Paratypes**; A150 (Johnson Pt.) - 1 female. CMN coll'ns.

BRITISH COLUMBIA:
North-central coast, C. Levings Stn. 51B-C30 (Swanson Bay), 38 m. dredge, April 4, 1973 - 1 female.
South-central coast, ELB Stn. E3 (Indian Arm), Nov. 4, 1977, dredge - 1 male, 1 female.
Southern Vancouver Island, G. O'Connell Stn..(off McCauley Pt., Victoria), dredge, 66 m. July, 1977 - 2 females.

Diagnosis. Female ov. (9.5 mm) (Allotype). Pleon segment 1 with centre tooth and single small lateral denticle on each side; pleon plates 2 and 3 with small postero-distal tooth and 2 slightly smaller lateral denticles on each side. Urosome 1 with central tooth and single small lateral denticles. Urosome 2 with 2 postero-dorsal pairs of short subequal teeth and single long spines extending well beyond teeth.

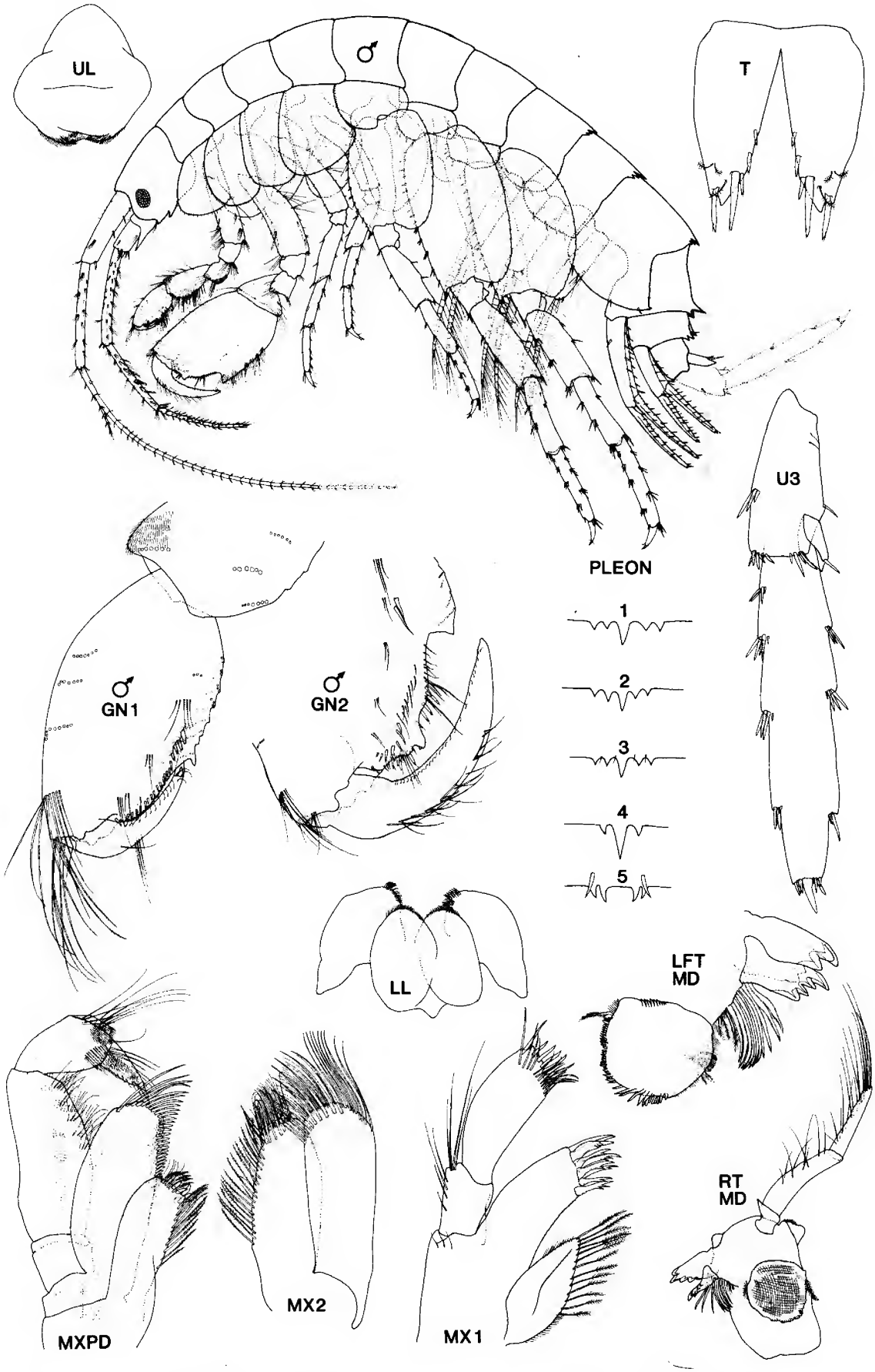

Fig. 14. ***Megamoera glacialis*****, new species. College Fiord (A110), Alaska. Male (12.0 mm).**

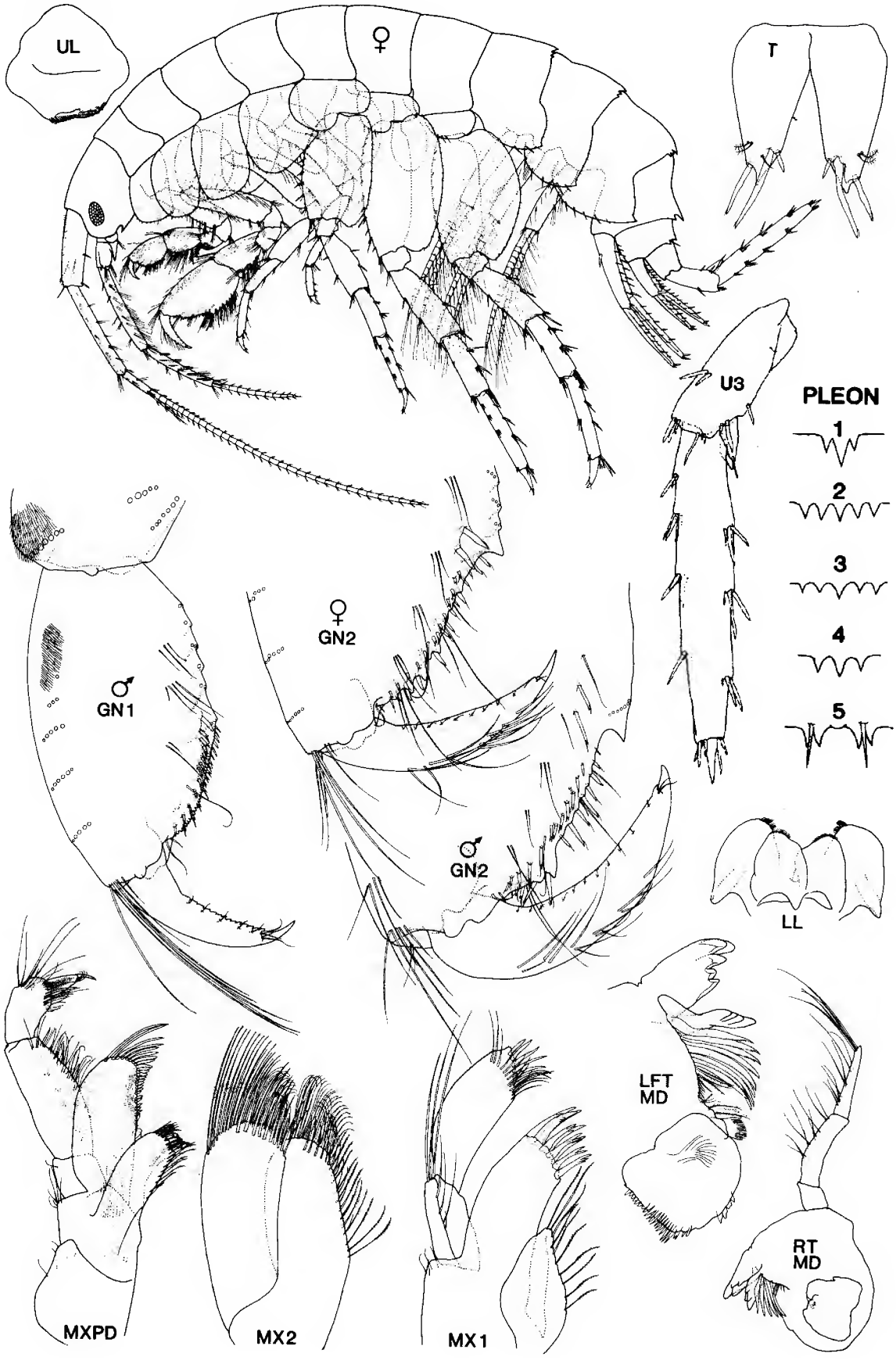

Fig. 15. ***Megamoera borealis,*** **new species. College Fiord (A110), Alaska. Male (8.0 mm); female (9.5 mm).**

Anterior head lobe strongly rounded, lower margin with single tooth in female; inferior sinus a rounded notch. Eye ovate, medium. Antenna 1, peduncular segment 2 long-er than 1, segment 3 short; accessory flagellum 3-segmen-ted; flagellum slender, 30-35-segmented. Antenna 2, flagel-lum short, 10-segmented, subequal to peduncular segment 5.

Mandible, spine row with 10-12 blades; palp segment 3 moderately setose, setae in 4 clusters. Maxilla 1, inner plate with 10 marginal setae; palp segment 1 with 6-7 lateral setae. Maxilla 2, facial setae of inner plate strongly reduced (6-7) in distal, medial, closely submarginal row. Maxilliped, inner plate with 8-9 inner marginal setae; outer plate, inner marginal spines merging apically with 6 slender curved spines; dactyl basally stout, unguis curved.

Coxa 1 not expanded distally, anterior margin sharply rounded. Coxa 4 relatively broad, lower margin oblique, antero-distally broadly rounding. Gnathopod 1, basis antero-distally weakly setose; propod shorter than carpus, palm distinct, smooth, steeply oblique; dactyl regular, inner margin serrulate. Gnathopod 2, carpus, hind lobe medium, shallow, margin with 5-6 setal clusters; propod relatively large, subrectangular, palm oblique, slightly convex, weakly toothed, hind margin with 10-12 setal clusters; dactyl ordinary, unguis small, outer margin distally setose.

Peraeopods 3-4 unequal, dactyls medium. Peraeopods 5-7, bases regular, increasing posteriorly, hind margins finely crenulate; dactyls medium, length ~1/4 segment 6.

Pleon plates 1-3, hind corners weakly toothed, not produced. Uropods 1 & 2, rami elongate, strongly spinose, tips extending beyond peduncle of uropod 3. Uropod 3, outer ramus slender, margins with 3-4 clusters of slender spines; terminal segment distinct, length 3-4 X basal width.

Telson lobes stout, diverging distally, fused weakly basally; proximal notch medial; notch spines relatively long, slender; inner marginal spines virtually lacking.

Coxal gill 6 somewhat smaller than gill 5.

Male (8.0 mm) (Holotype). Gnathopod 1, propod short, sub-ovate, palm convex, very oblique, separated indistinctly from posterior margin by low tooth at palmar angle; dactyl with slight basal bulge; inner margin finely serrated. Gnatho-pod 2, carpus with short lower margin, weakly setose; propod medium, subrectangular, palm oblique, convex, inner marginal spines distad of low, irregular hinge tooth, postero-distal tooth acute; dactyl normal, outer margin strongly setose, tip with fused unguis.

Etymology. From the Latin "borealis" meaning northern, in reference to the northern Pacific distribution of the species.

Distributional ecology. Recorded from the Aleutian islands and southeastern Alaska to southern British Columbia, from the shore line subtidally to depths of 66 m.

Taxonomic commentary. *Megamoera borealis* is most closely related to *M. glacialis* in characters of the key and in the commentary (p. 27). It is also closely similar to *M. kodiakensis* (p. 37).

Megamoera mikulitschae (Gurjanova)
(Figs. 16, 17)

Melita mikulitschae Gurjanova, 1953: 225, fig. 10.—Kara-man, 1981: 41.

Material Examined.

ALASKA:

Aleutian Islands. Unimak I., P. Slattery Stns., June-Oct., 1982. - 1 male (30.0 mm) **(figured specimen)**. CMN collections.

Diagnosis: Male (30. 0 mm) A large, robust species with large peraeopod bases. Pleon segments 1 & 2 with postero-dorsal tooth and 3 small lateral denticles on each side. Pleon 3, postero-dorsal tooth with 5 unequal denticles on each side. Urosome 1, postero-dorsal tooth with single denticle on each side. Urosome 2 with paired short teeth and very short spine on each side. Anterior head lobe shallow, inferior margin with prominent lobe; inferior antennal sinus a short notch. Antenna 1, peduncle 1 long, stout; peduncle 3 very short; accessory flagellum 6-segmented; flagellum slender, with 40+ segments. Antenna 2, peduncular segment 3 relatively long; flagellum short, little longer than peduncle 5, with about 16 segments.

Mandible, blades numerous (12+), slender; left lacinia 4-dentate; right lacinia 5 dentate; palp segments 2 & 3 strongly setose. Maxilla 1, inner plate, inner margin with 16+ setae; palp segment 1 with 8-10 lateral setae, outer segment broadening distally, apex rounded. Maxilla 2, facial setae reduced (8-10), distally closely submarginal; outer plate rounded distally. Maxilliped, inner plate medium, with 10-12 inner marginal setae; palp segment 2 medium broad; dactyl basally stout, medium short.

Coxa 1-3 medium deep, relatively broad, strongly overlapping, weakly notched behind. Coxa 4 largest and deepest, lower margin gently convex. Gnathopod 1 , basis antero-distally setose; propod relatively large, broadening distally, nearly as long as carpus, palm smooth, oblique, dactyl normal, inner margin finely setulose. Gnathopod 2, carpus medium, posterior lobe, distinct lower margin with 5-6 clusters of longish setae; propod large, subrectangular, hind margin strongly setose; palm oblique, hinge tooth small; dactyl stout, outer margin strongly setose.

Peraeopods 3 & 4 unequal; dactyls medium. Peraeopods 5-7, bases very large, broad, increasing posteriorly, lobate below; segment 4 slightly broadened; segment 6 shorter than segment 5, dactyls medium, ~1/4 length segment 6. Peraeopod 5 distinctly smallest.

Pleon plates 1 & 2, hind corners squared. Pleon 3, hind corner weakly produced, length of tooth about equal to its basal width. Uropods 1 & 2 very strong, rami elongate, regularly spined. Uropod 3, outer ramus slender, elongate, tapering, terminal segment various. Telson lobes stout, basally separated, proximal notch lateral, notch spines short; inner marginal spines lacking.

Coxal gills large, plate-like on peraeopods 2-5, some-what smaller on peraeopod 6.

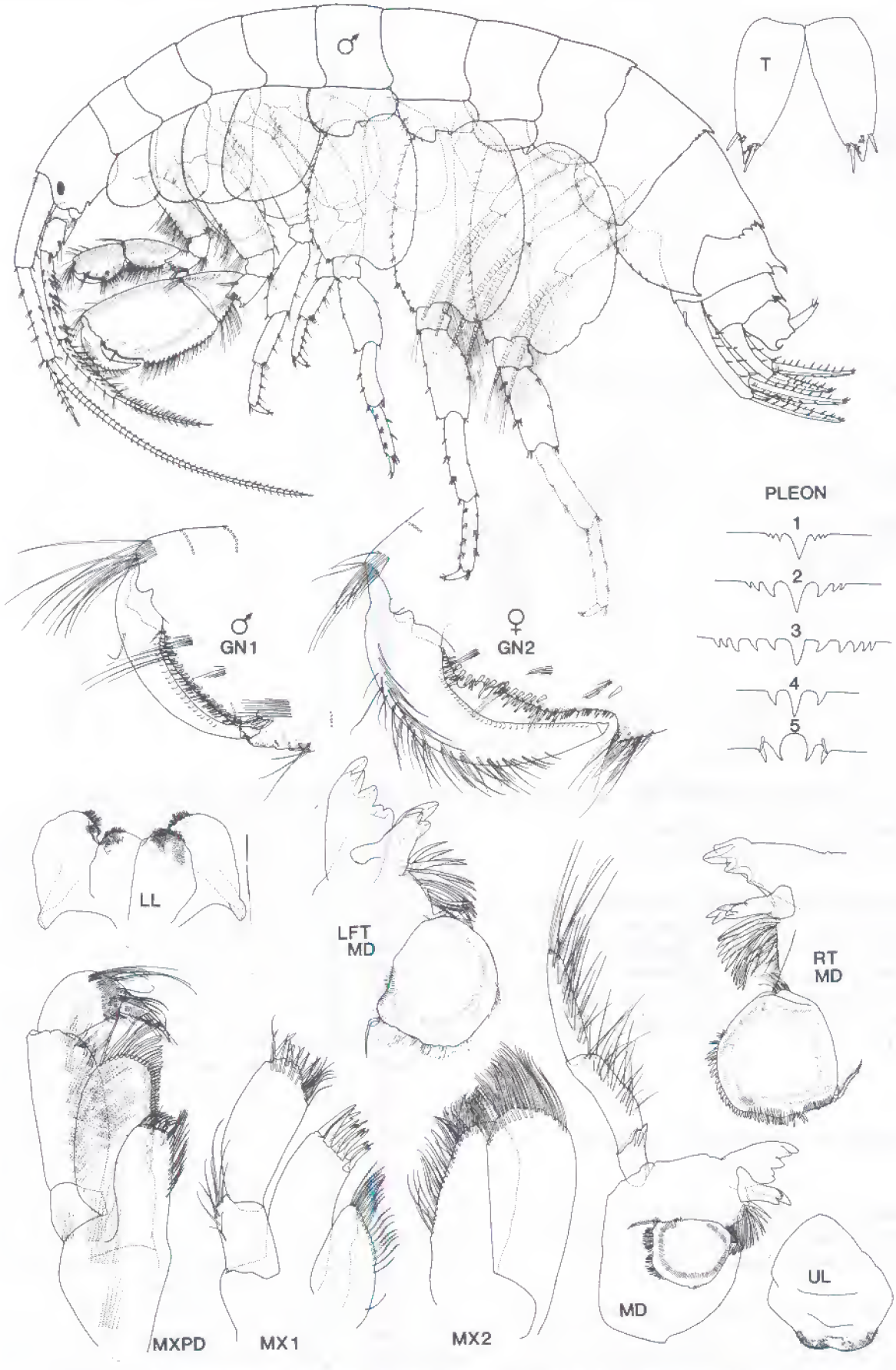

FIG. 16. *Megamoera mikulitschae* (Gurjanova). Unimak I., Alaska. Male (30.0 mm).

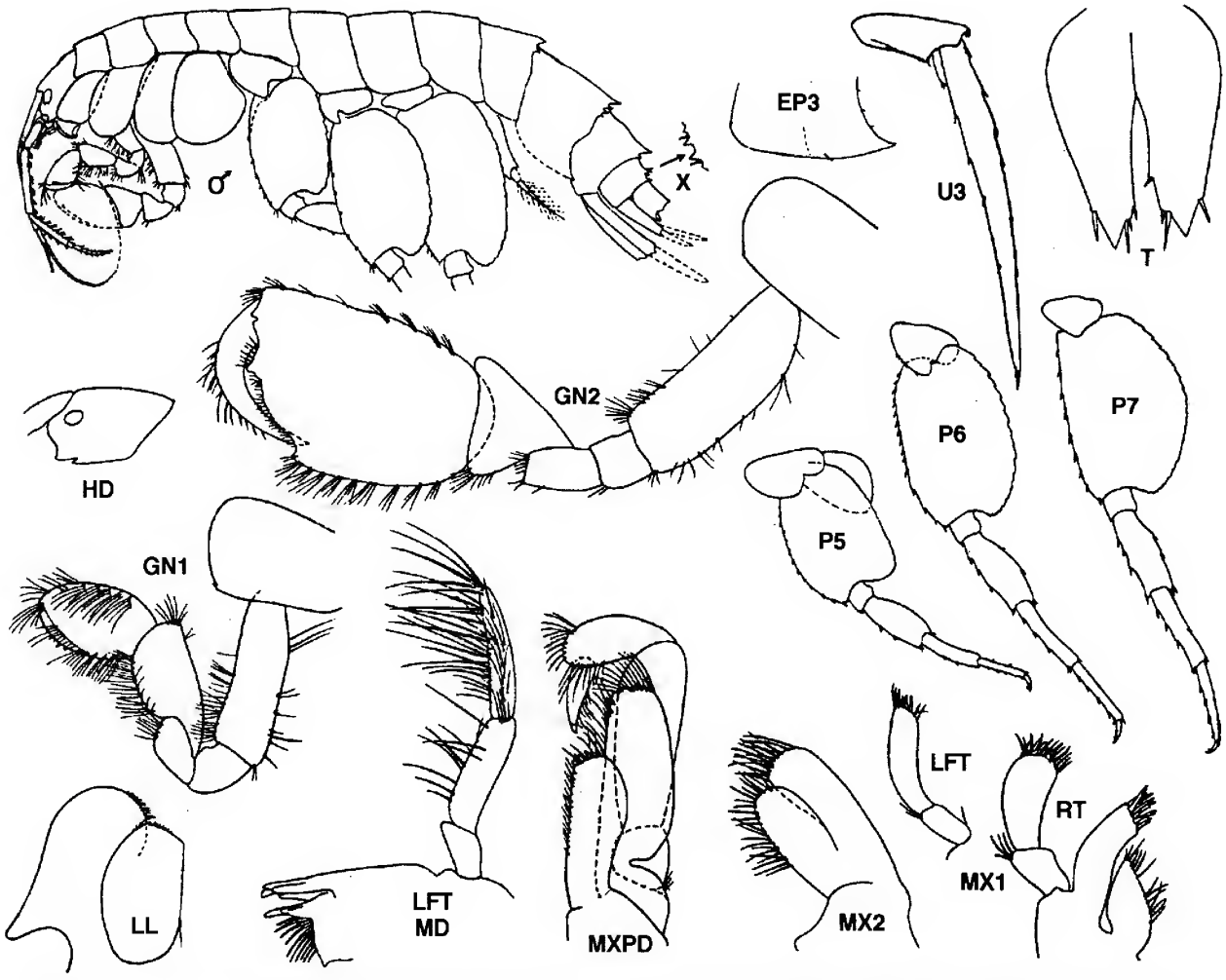

FIG. 17. ***Megamoera mikulitschae*** **(Gurjanova). Paramir I., Kurile Islands. Male (34.0 mm).**

Distribution: Unimak I., Okhotsk Sea, Bering Sea, Chukchi Sea, at littoral to sublittoral depths.

Taxonomic & distributional commentary: *Megamoera mikulitschae* is primitive and relatively isolated, but clusters closest to the *M. dentata* subgroup (p. 66). It is distinguished by its large size, strong inferior antennal head process, very large bases of peraeopods 5-7, weakly produced hind corner of pleon plate 3, and the slender, elongate, tapering uropod 3.

Megamoera kodiakensis (J. L. Barnard)
(Fig. 18)

Melita kodiakensis, J. L. Barnard, 1964: 315-335, figs. 1-12. —Barnard & Barnard, 1983: 665.—Austin, 1985: 610. *Abludomelita kodiakensis* Karaman, 1981: 40.

Diagnosis. Male (12.0 mm). Pleon segments 1 & 2 with centre tooth and 3-4 minute lateral denticles on each side; pleon 3 with centre tooth and 2-3 lateral denticles. Urosome 1 with central tooth and large single lateral tooth on both sides. Urosome 2 with 2 pairs of short teeth and single spines on each side. Anterior head lobe very shallow, lower margin with prominent accessory process; inferior antennal sinus a short notch. Eye medium, rounded. Antenna 1, peduncular segments short, accessory flagellum 3-segmented; flagellum ~25-segmented. Antenna 2, flagellum slender, much longer than peduncular segment 5, ~14-segmented.

Mandible, spine row with 10-12 blades; palp segment 3 very weakly setose (6 setae). Maxillae 1 and 2 and maxilliped not described, probably much as in *Megamoera glacialis.*

Coxae 1-3 medium, weakly notched below. Coxa 1 distally broadened, anterior margin rounded. Coxa 4 relatively narrow, lower margin gently convex. Gnathopod 1, basis, antero-distally very weakly setose; propod small, subrectangular, shorter than carpus, palm distinct, smooth, oblique; dactyl regular. Gnathopod 2, carpus, hind lobe narrow, small, with single apical seta; propod large, subrectangular, palm oblique, strongly toothed, hind margin with 8-9 clusters of short setae; dactyl regular, apex attenuated, setation of outer margin not indicated nor described.

Peraeopods 3-4 unequal, dactyls medium short. Peraeopods 5-7, bases regularly broadened, increasing posteriorly, hind margins crenulate; segment 4 slightly broadened; dactyls medium, each ~1/5 segment 6.

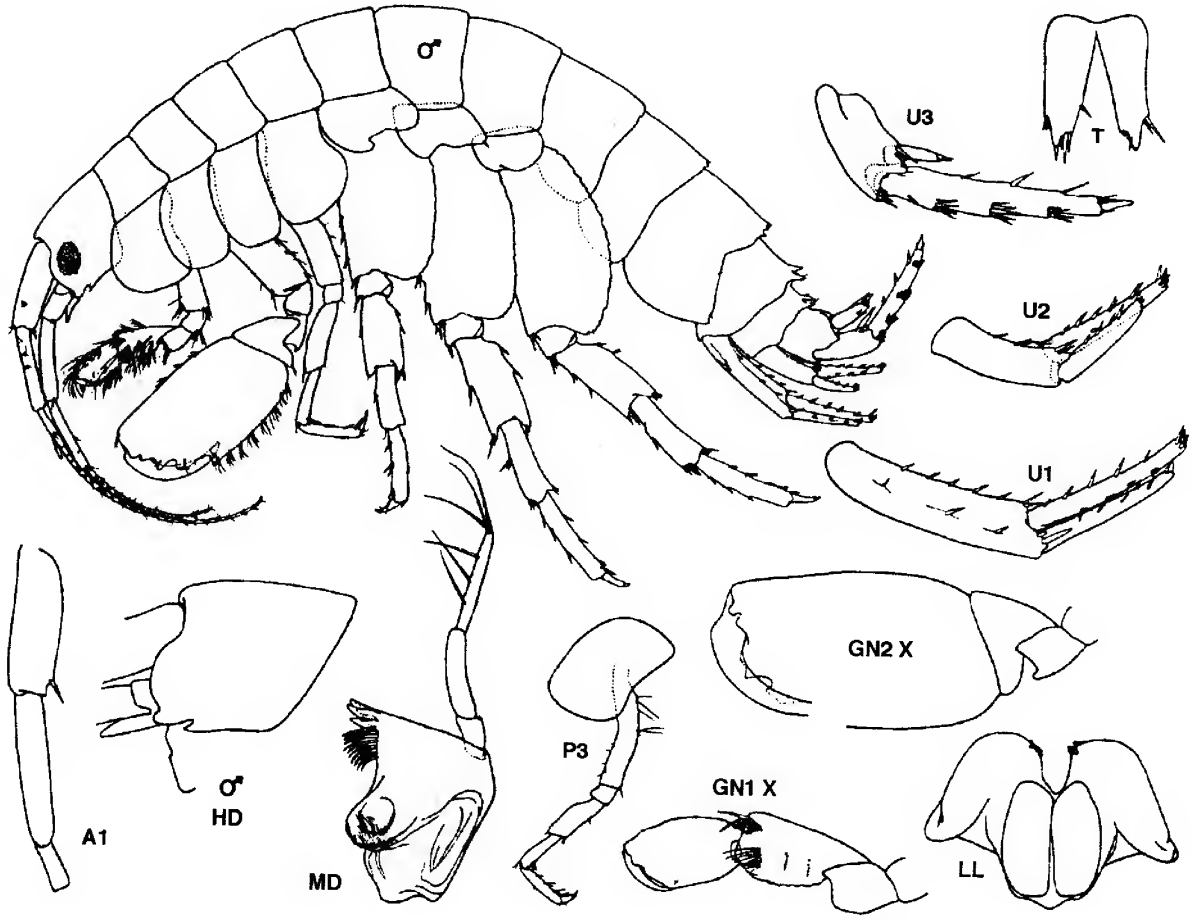

FIG. 18. ***Megamoera kodiakensis*** **(J. L. Barnard, 1964). Kodiak I., Alaska. Male (12.0 mm). (after Barnard, 1964).**

Pleon plates 1- 3, hind corners squared, not acuminate. Uropods 1 & 2, rami relatively short, tips of rami little exceeding peduncle of uropod 3; outer ramus distinctly the shorter in both. Uropod 3, inner ramus relatively long; outer ramus stout, relatively short, margins with 3-4 clusters of medium spines; terminal segment distinct, length 3-4 X basal width.

Telson lobes slender, diverging distally, fused slightly basally; proximal notch lateral, notch spines slender; 0-1 inner marginal spines.

Coxal gills undescribed.

Female unknown.

Distributional ecology. Known only from bathyal depths off Kodiak Island, Gulf of Alaska.

Taxonomic commentary. Barnard's original description of *"Melita" kodiakensis* is limited, but sufficiently complete to facilitate assignment of the species to the genus *Megamoera* as here defined. The species clusters relatively closely with *M. unimaki* and *M. glacialis*, within the *dentata* subgroup of *Megamoera*.

Melitoides Gurjanova
(Fig. 19)

Melitoides Gurjanova, 1934: 127, fig. 5.—Gurjanova, 1951: 752, fig. 522.—Barnard 1969a: 245.—Barnard & Barnard, 1983: 671.

Type species. *Melitoides makarovi* Gurjanova, 1934: 127 (monotypy).

Species. *Melitoides* (?)*valida* (Shoemaker, 1955).

Diagnosis. Pleon segments 1-2 smooth; pleon 3 moderately mid-dorsally toothed or humped. Urosome segments 1 & 2 mid-dorsally toothed. Head with single inferior antennal notch. Pigmented eyes lacking. Antennae regular.

Upper lip shallowly notched. Lower lip, outer lobes acute, directed laterally; inner lobes large. Mandible, spine row with few blades; left & right lacinia undescribed; palp segment 3 > segment 2; segment 1 elongate, lacking cusp. Maxilla 1, inner plate tall, with medial and apical setae, outer plate 7-spinose (Barnard & Barnard, 1983); palp segment 1 with shoulder setae; segment 2 slightly broadening. Maxilla

2, inner plate with closely submarginal setae only. Maxilliped, plates tall, medium; palp segment 2 columnar; dactyl strong.

Coxal plates 1-4 broad, deep. Coxa 1 distally expanded. Gnathopod 1 (male), carpus relatively long; propod relatively short, margins strongly setose; dactyl regular. Gnathopod 2 (male), carpus short, deep; propod large, subrectangular; palm strongly toothed; dactyl regular, outer margin probably strongly setose.

Coxa 6, anterior lobe not modified in female. Peraeopod 4 shorter than 3. Peraeopod 5 << peraeopods 6 & 7; bases (of all) very large, broad, weakly lobate; segments 4-6 slender, attenuated; dactyls medium long.

Pleon plates 1-3, hind corners weakly or not acuminate. Uropods 1 & 2 regular, rami linear. Uropod 3, inner ramus scale-like, outer ramus short, 1-segmented, not extending beyond rami of uropods 1 & 2. Telson lobes fused basally, apices sub-tuncate, with single spines.

Coxal gills and brood plates undescribed.

Taxonomic and distributional commentary. This genus is a marginal member of the *Abludomelita* group of genera, differing in a number of character states, including the total reduction of the terminal segment of uropod 3, and the basally fused lobes of the telson.

The type species, *Melitoides makarovi,* is known only from the eastern Siberian and Bering Seas, to Iterup I., in sublittoral depths (27 m).

Melitoides makarovi Gurjanova
(Fig. 19)

Melitoides makarovi Gurjanova, 1934: 127, fig. 5.—Gurjanova, 1936: 39, figs. 1, 2.—Gurjanova, 1951: 753, fig. 522.—Barnard, 1969a: 245.—Barnard & Barnard, 1983: 671.

Material Examined. None from Bering Sea and other regional localities.

Diagnosis. Male (30.0 mm). With the characters of the genus. Pigmented eyes lacking. Anterior head lobe sharply rounded. Antenna 1, flagellum ~40-segmented. Antenna 2, flagellum ~15-segmented.

Maxilliped, inner plate not exceeding slender palp segment 2. Coxae 2-4 deeper than broad. Gnathopod 2, propod, anterior and posterior margins subparallel, palm nearly vertical. Peraeopods 5-7, bases very broad. Peraeopods 6 & 7 elongate; postero-distal lobes of bases squared or acute behind.

Pleon 3 rounded behind. Uropod 3, outer ramus, margins with 2-3 clusters of short spines only. Telson lobes appearing fused basally, apices each with single short spine.

Female undescribed.

Taxonomic and distributional commentary. Recorded from the eastern Siberian Sea to the Bering Sea, in depths to 27 m. *M. makarovi* may overlap distributionally with *M. valida* (Shoemaker), with species of *Quasimelita,* and with *Megamoera mikulitschae* (Gurjanova).

Melitoides (?) ***valida*** (Shoemaker)
(Fig. 20)

Melita valida Shoemaker, 1955: 50, fig. 15.—Barnard, 1958: 62.—Barnard & Barnard, 1983: 666.
Abludomelita valida (Shoemaker) Karaman, 1981: 40.

Material examined. None from the study region.

Diagnosis. Male (to 30.0 mm) (details from Shoemaker, 1955). Pleon segments 2 & 3 very finely toothed middorsally. Urosome segments 1 & 2 weakly toothed posterodorsally. Inferior antennal sinus shallow, cusp small, regressed. Eye small, indistinct. Antenna 1 large; peduncular segment 3 relatively long; accessory flagellum 3-segmented; flagellum elongate (40+ segments). Antenna 2, peduncle 3 long, gland cone long; flagellum longer than peduncle 5, 13-segmented.

Mandible, spine row with many blades (12+?); right lacinia with bifid apex; palp segment 3 > 2, strongly setose; Maxilla 1, inner plate triangular, inner margin setose;palp segment 1 with 3 groups of lateral setae; segment 2 widening distally. Maxilla 2 , inner plate slightly the shorter (facial setae undescribed). Maxilliped, outer plate tall, slightly exceeding slightly broadened palp 2, apex with slender curved graduated spines only; dactyl of palp medium strong.

Coxae 1-4 large, deep, increasing posteriorly,weakly or not cuspate behind. Coxa 1 broadened distally. Gnathopod 1 (male), basis moderately setose antero-distally; carpus slender, shallowly lobate; propod shorter. Gnathopod 2, carpus short, deep; propod large, widening distally; palm oblique, convex, strongly toothed; dactyl large, outer margin smooth (no setae shown by Shoemaker, loc. cit.).

Peraeopod 4 slightly smaller than 3, both with relatively short segments 5 & 6; dactyls medium. Peraeopod 5 distinctly smaller than 6 & 7; bases large, medium broad, hind lobes medium; distal segments and dactyls medium long.

Pleon plates 1 rounded behind; pleon plate 2 with small hind tooth; pleon 3 moderately produced, acute (Shoemaker figure). Uropods 1 & 2 regular, rami lanceolate, reaching beyond peduncle of uropod 3. Uropod 3, inner ramus scale-like, apex acute; outer ramus elongate, narrow, margins with 5 clusters of spines, terminal segment indistinct.

Telson lobes basally fused, diverging, notches subapical, with single spine, proximal notch lateral; Coxal gills not described.

Distribution. Known only from Pt. Barrow, Alaska.

Taxonomic commentary. This species is tentatively assigned to genus *Melitoides* because of its overall similarity to *M. makarovi* in morphology, size, and Arctic distribution.

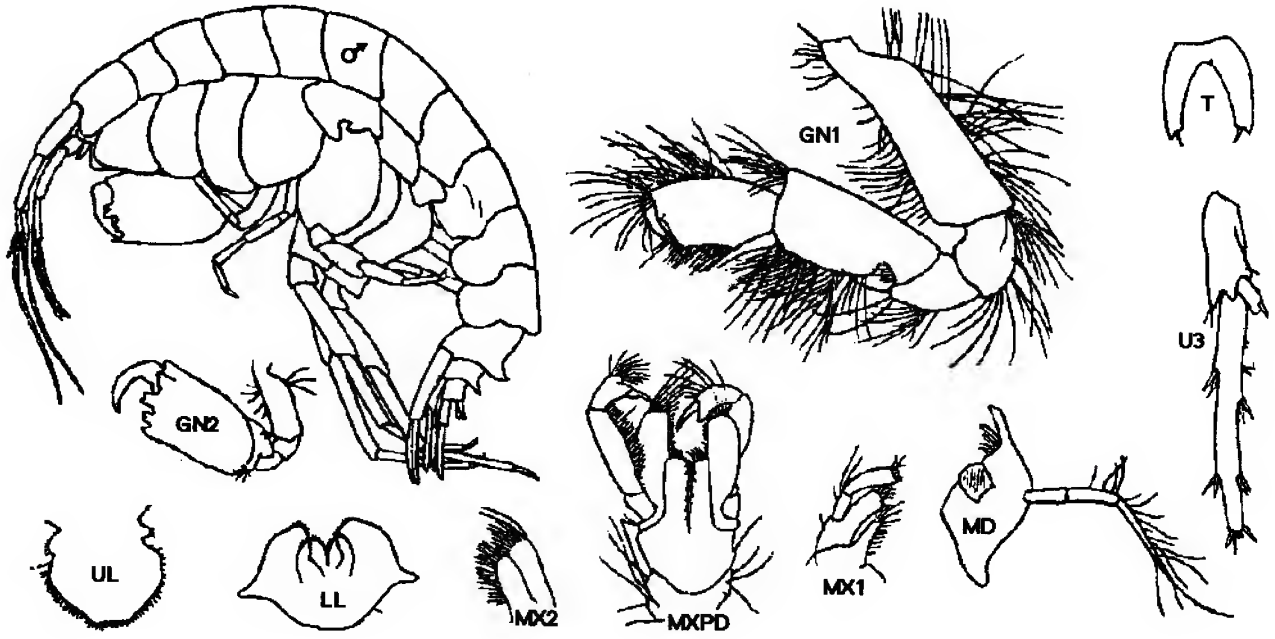

FIG. 19. ***Melitoides makarovi*** **Gurjanova, 1934. Male (19.0 mm). Eastern Siberian & Bering Seas.**

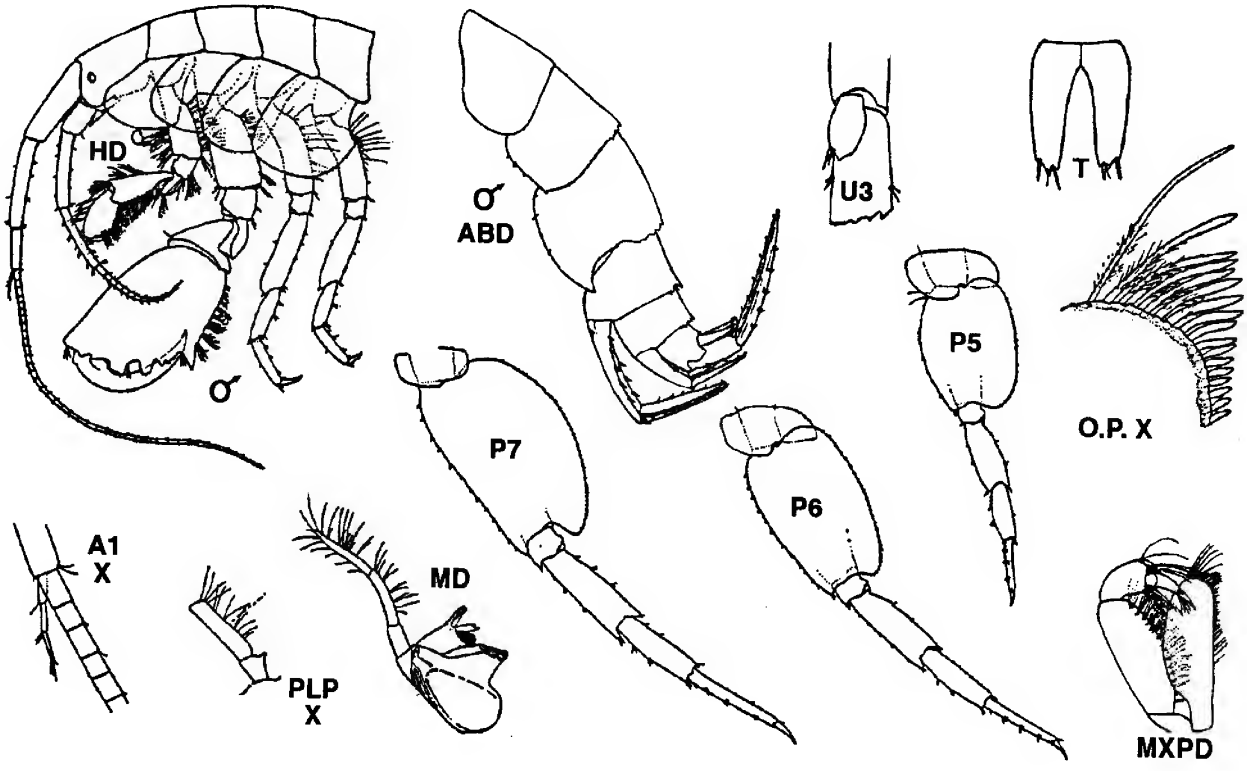

FIG. 20. ***Melitoides*** **(?)** ***valida*** **(Shoemaker, 1955). Male (28.0 mm). Pt. Barrow, Alaska. (after Shoemaker, 1955).**

Quasimelita, new genus

Melita Stebbing, 1906: 421 (part).—Karaman, 1981: 41 (part).—Barnard & Barnard, 1983: 664 (part).

Type species: *Melita quadrispinosa* Vosseler, 1889.

Species: *Quasimelita formosa* (Murdoch,1885); *Q. abyssorum* (Stephensen, 1944).

Diagnosis: Combining character states of *Melita* and *Abludomelita* but with distinctive features, especially of mouthparts and gnathopods. Pleon weakly toothed to smooth dorsally. Urosome segment 1 with dorsal tooth. Urosome 2 with dorsal teeth (usually paired) and usually single spines on each side. Anterior head lobe rounded; inferior antennal sinus broadly incised. Antenna 1, peduncular segment 3 short.

Upper lip incised below. Lower lip, inner lobes large. Mandible, spine row short; palp weak, segment 1 lacking distal process; left lacinia 4-dentate, right lacinia 3-dentate; incisor irregularly dentate. Maxilla 1, inner plate triangular, weakly setose medially; outer plate with 9 apical spines; palp segment 1 with lateral setae; segment 2 apically spinose and setose. Maxilla 2, inner plate, with few facial setae, submarginally positioned. Maxilliped, inner plate tall; outer plate broad, apical margin setose; palp segment 2 very stout, dactyl short.

Coxae 1-4 medium to shallow and may decrease in size and depth posteriorly. Coxae 1-3, lower margin rounded or squared, hind corner lacking cusp. Coxa 1 slightly broadened distally. Coxa 4 small, posterior proximal excavation weak or lacking. Gnathopods 1 & 2 conspicuously sexually dimorphic. Gnathopod 1, propod shorter than carpus, margins strongly setose; palm and dactyl short. Gnathopod 2 (male), carpus large, with broadly setose lower margin; propod large, broadening distally, palm irregularly toothed, postero-distal process large; dactyl with outer marginal setae.

Peraeopods 3 & 4 unequal; segment 4 stout; dactyls well developed. Peraeopods 5-7, bases deep, variously narrowed, hind lobes reduced, small; dactyls well developed.

Pleon segment 3, hind corner produced. Pleopods elongate; peduncles strongly setose laterally. Uropods 1 & 2 regular; distal peduncular spine weak; rami lanceolate, margins spinose. Uropod 3, outer ramus strong, 2-segmented. Telson lobes weakly (or not) fused basally, marginal notches closely subapical. Coxal gills 2-5 large, saclike; gill 6 small.

Etymology: From the Latin "*quasi*" meaning "resembling" and the root stem *"Melita"*.

Taxonomic and Distributional commentary. This genus combines a number of character states that are transitional between *Megamoera* and *Melitoides*. Three species are recognized: *Quasimelita quadrispinosa* and *Q. formosa* are littoral to sublittoral arctic and subarctic forms, and *Q. abyssorum* is abyssal in the North Atlantic region.

Quasimelita quadrispinosa (Vosseler) (Figs. 21, 22)

Melita quadrispinosa Vosseler, 1889: 157, figs. 15-24.—Stebbing, 1906: 422.—Gurjanova, 1951: 751, fig. 520.—Karaman, 1981: 41.—Barnard & Barnard, 1983: 666.

Material Examined.
ALASKA:
Southeastern Alaska, ELB Stn. A83 (Cordova Bay), in silt and gravel at LW level, June 30, 1961 - 1 female br. I (9.0 mm) **(figured)**, CMN collections, Ottawa.

Diagnosis. Female (9.0 mm). Urosome segment 1 with strong postero-dorsal tooth. Urosome 2 dorsal teeth short, spines slender. Anterior head lobe large, rounded, lower margin smooth. Eye small, round. Antenna 1, peduncle 3 short; accessory flagellum 6-segmented; flagellum ~20-segmented. Antenna 2, peduncular segments 3-5, posterior margins with strong setal clusters; flagellum short, 10-segmented.

Upper lip incised. Mandible, spine row short, with 6-7 blades; palp segment 3 short, weakly setose (6-7 setae). Maxilla 1, inner plate with 6-7 marginal setae; palp segment 1 with 5-6 lateral setae. Maxilla 2, facial setae of inner plate very reduced (4-5 setae), distally medial, closely submarginal. Maxilliped, inner plate with 6 widely spaced inner marginal setae; outer plate, inner marginal spines merging apically with 7-8 slender curved seta-like spines; palp segment 2 very broad, massive; dactyl short, basally stout.

Coxa 1 slightly expanded distally, anterior margin rounded. Coxa 4, lower margin nearly straight. Gnathopod 1, basis, antero-distal margin setose throughout; propod relatively shallow, shorter than carpus, distally narrowing to short, nearly vertical, smooth palm that is armed distally on both margins with numerous closely set small spines; dactyl short, basally stout. Gnathopod 2, carpus large, hind lobe shallow, lower margin with 8-10 clusters of longish setae; propod large, subrectangular, longer than carpus; palm oblique, irregular, weakly toothed; dactyl stout, unguis acute, outer margin lined with single row of 8-9 setae.

Peraeopods 3-4, segments 5 & 6 with posterior marginal setal clusters; dactyls medium,length ~1/3 segment 6. Peraeopods 5-7, bases large, increasingly broad posteriorly, hind margins weakly crenulate; segment 4 little broadened; dactyls medium, slender. Coxa 6, anterior lobe unmodified.

Pleon plates 1 & 2, hind corners acuminate; pleon 3, hind corner moderately produced, slightly upturned, acute. Uropods 1 & 2 stout, rami lanceolate, regularly spinose, tips extending well beyond peduncle of uropod 3. Uropod 3, outer ramus stout, tapering distally, margins with 4-5 clusters of medium spines; terminal segment distinct, length 3-4 X basal width.

Telson lobes fused basally, diverging distally, marginal notches small, proximal notch lateral, each with medium spine, inner and outer margins each with single spines.

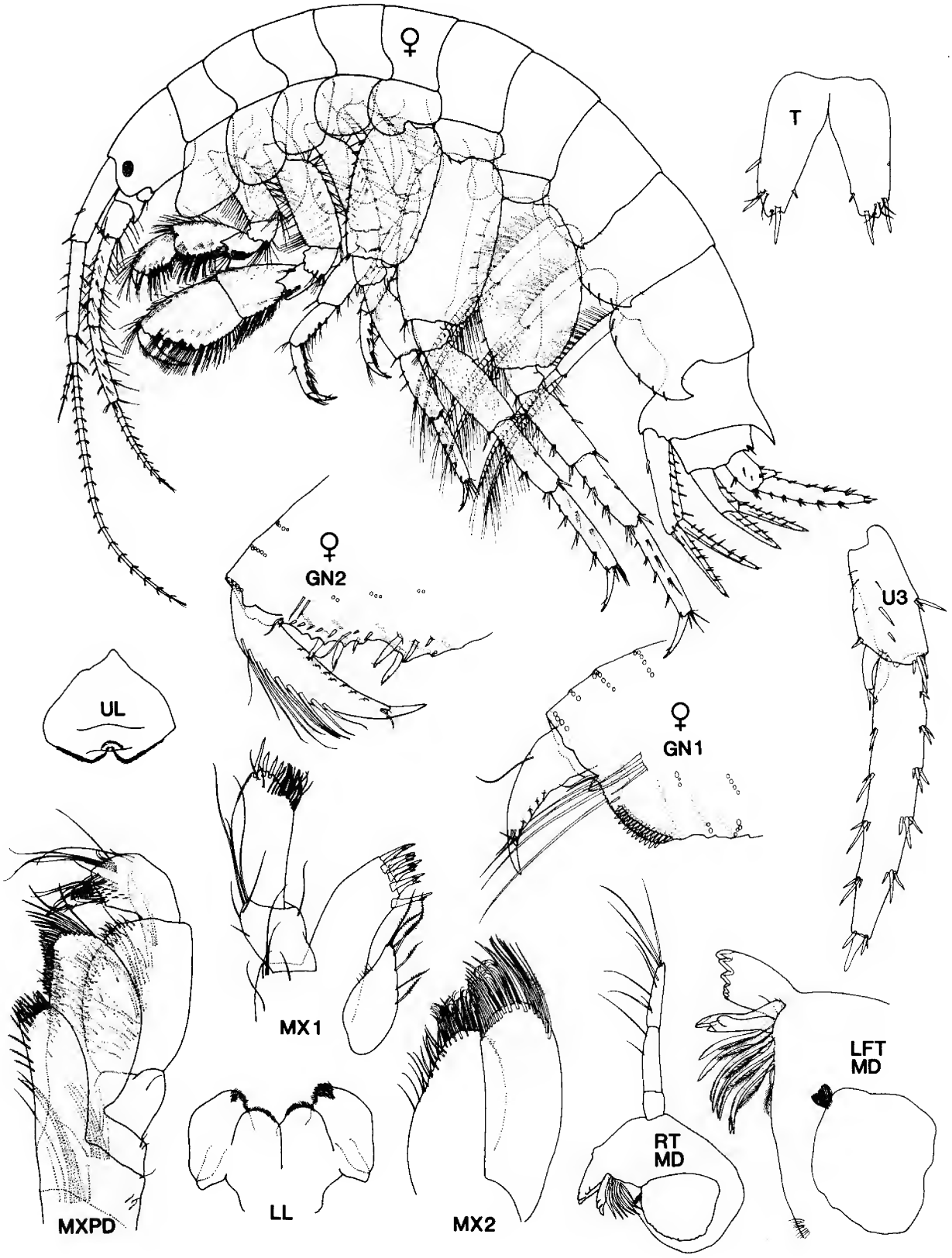

FIG. 21. ***Quadrimelita quadrispinosa*** **(Vosseler). Cordova Bay, Southeastern Alaska. Female (9.0 mm).**

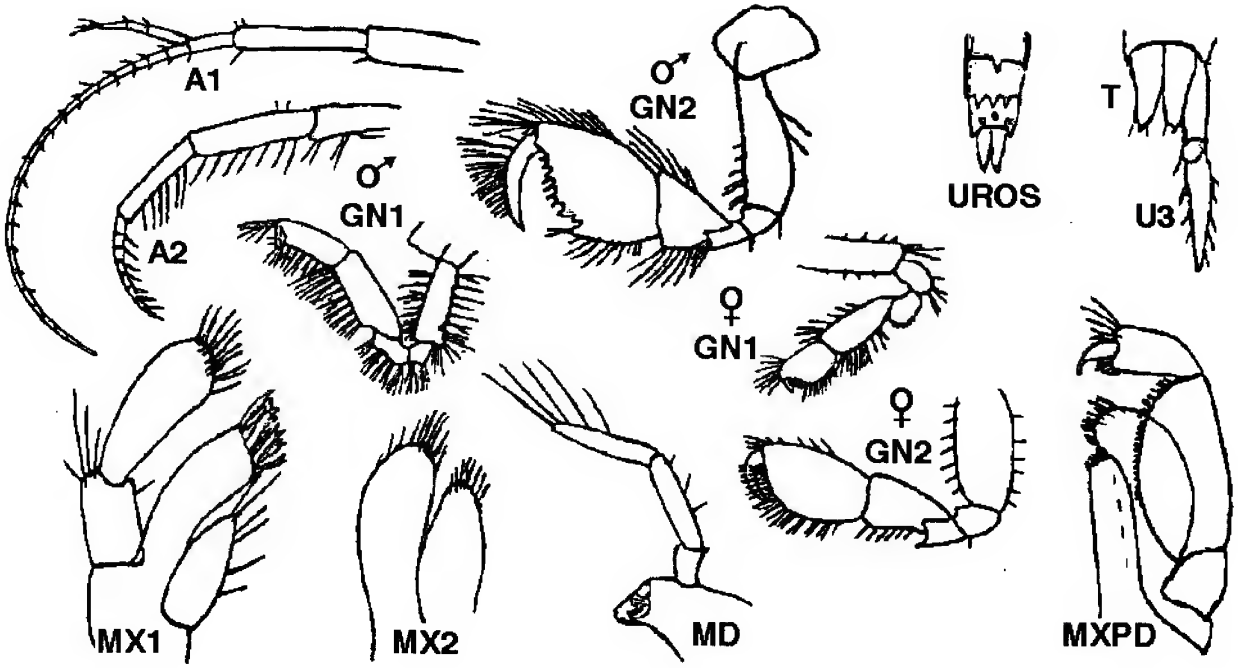

Fig. 22. ***Quasimelita quadrispinosa*** **(Vosseler). Barents Sea. Male (11.5 mm); female (10.0 mm). (after Vosseler, 1889; Gurjanova, 1951).**

Coxal gill 6 much smaller than coxal gill 5.

Male (11.5 mm)(after Gurjanova, loc cit.). Gnathopod 1, propod and carpus slender, elongate, upper and lower margins subparallel, lower margin strongly setose; palm short, nearly vertical, dactyl short. Gnathopod 2, hind margin of carpus with 6-7 setal clusters; propod large, distally broadening, palm oblique, irregular, length ~ hind margin; outer margin of dactyl lined with long setae.

Distributional ecology: Recorded from the Barents, Chukchi and Bering Seas, at littoral and sublittoral depths.

Taxonomic commentary. Pleon segments 2 & 3 may appear smooth since the posterior dorsal teeth are very small.

Quasimelita formosa (Murdoch)
(Fig. 23)

Melita formosa Murdoch, 1885: 520.—Stebbing, 1906: 427.—Gurjanova, 1951: 748, fig. 517.—Shoemaker, 1955: 50.—Karaman, 1981: 40.—Barnard & Barnard, 1983: 665.

Material examined. Specimens from Resolute Bay, Arctic Canada, in CMN collections. Type from Arctic Alaska.

Taxonomic commentary: A large slender species, length to 30 mm (Shoemaker, 1955). Description and figures are meagre. The principal diagnositic features are as follows: Pleon segments 2 & 3 with single mid-dorsal tooth.. Urosome segments with mid-dorsal and adjacent teeth; urosome 2 with paired small dorso-lateral teeth. Peraeopods 5-7, coxae small, shallow; bases narrow, rectilinear, posterior margins strongly serrate, hind lobes small, acute.

Uropod 3, outer ramus, terminal segment small. The species may merit subgeneric status because of its unique morphological features.

Distributional ecology. Recorded by Shoemaker (1955) commonly at Pt. Barrow Alaska. Also known from northern Japan. Widely distributed across the Siberian and Canadian Arctic, in depths to 480 m.

Quasimelita abyssorum **(Stephensen)**
(Fig. 24)

Melita abyssorum Stephensen, 1944: 21, figs. 13-14.—Barnard, 1958: 61.—Barnard & Barnard, 1983: 664.
Abludomelita abyssorum Karaman, 1981: 40.

Taxonomic commentary. *Quasimelita abyssorum* conforms with most of the major diagnostic characters of the genus. It differs from the sublittoral arctic species (above)in its elongate antenna 1, elongate gnathopod carpi, strong baso-facial spine on the peduncle of uropod 1, and the relatively large coxa 4. Apparently, only the female has been described, so the degree of sexual dimorphism of the gnathopods is unknown. .

Distributional ecology: Known only from the type locality in the North Atlantic off Greenland, 2258 m. depth.

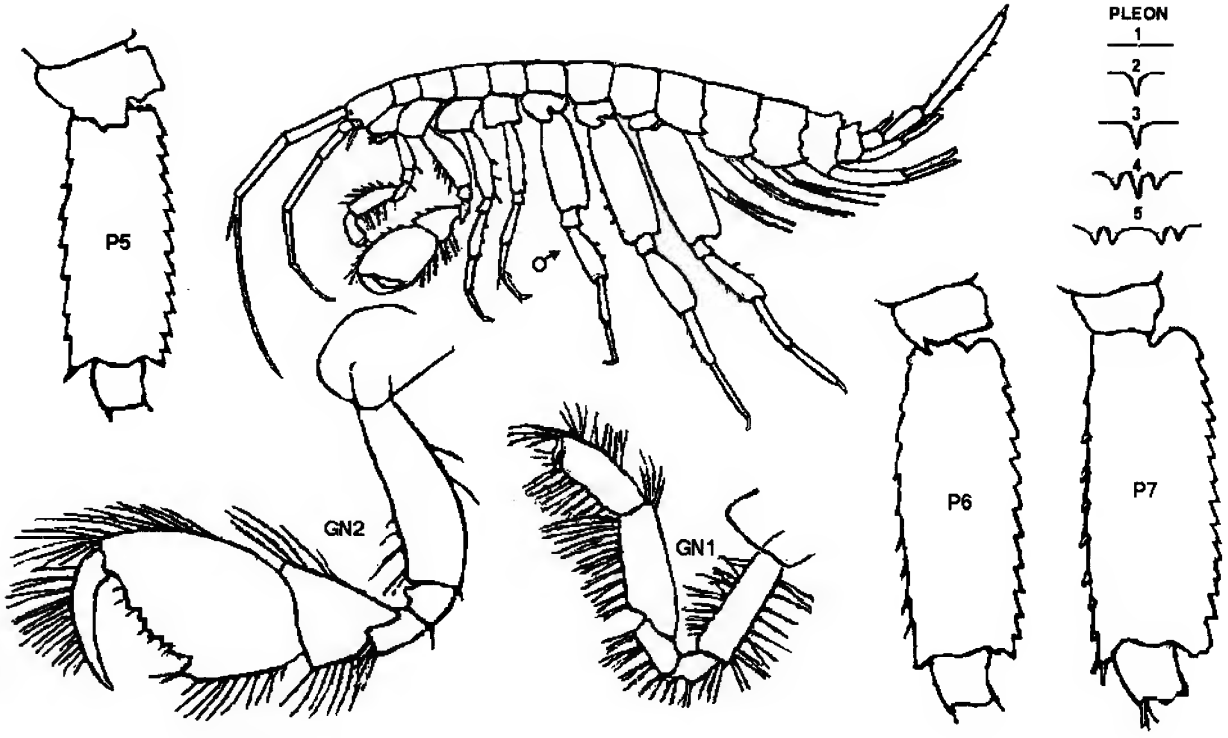

FIG. 23. ***Quasimelita formosa*** **(Murdoch). Pt. Barrow, Alaska. Male (21.0 mm) (after Stephensen, 1940).**

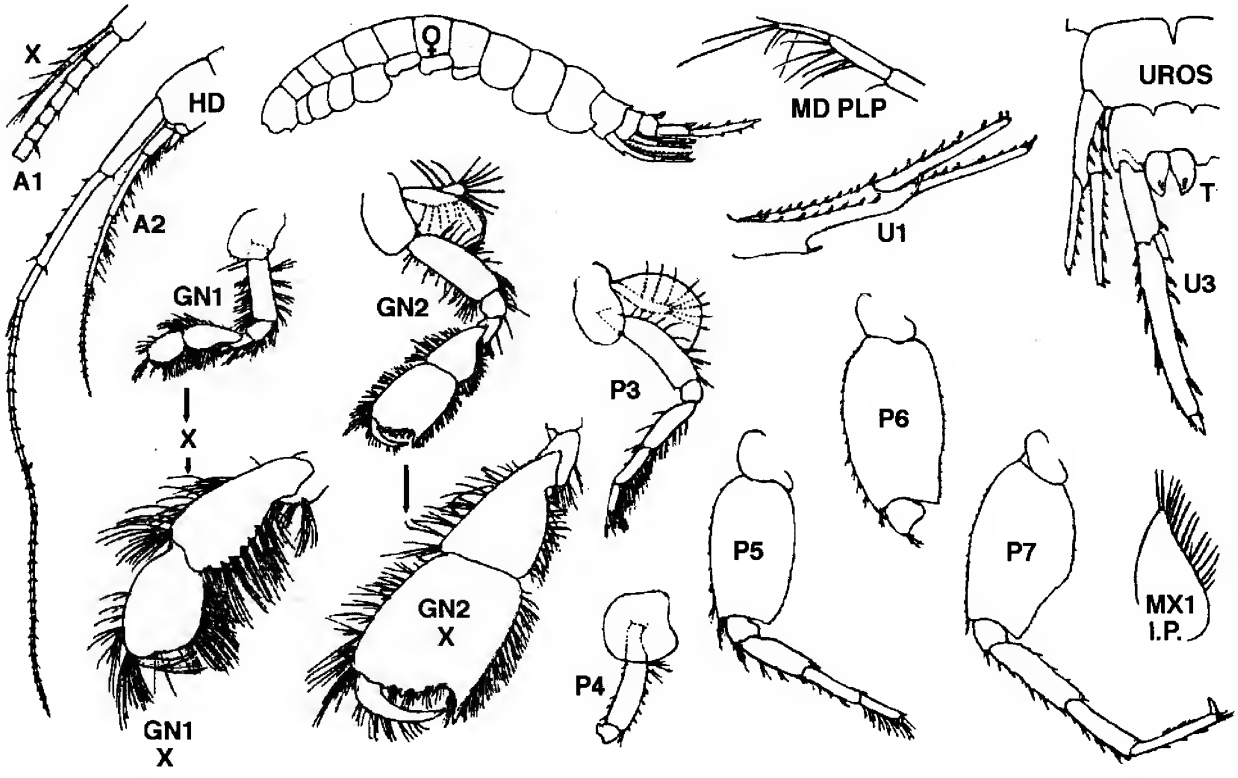

FIG. 24. ***Qaasimelita abyssorum*** **Stephensen, 1944. North Atlantic, 2258 m. Female (25.0 mm). (after Stephensen, 1944b).**

Desdimelita, new genus

Melita Barnard, 1969: 245 (partim). Barnard & Karaman, 1983: 664 (part).
Abludomelita Karaman, 1981: 40 (part).

Type species. *Melita desdichada* J. L. Barnard 1962, present designation.

Species. *Desdimelita californica* (Alderman, 1936); *Desdimelita microdentata*, new species; *Desdimelita microphalma*, new species; *Desdimelita barnardi*, new species.

Diagnosis. Male: Pleon smooth above. Urosome 1 usually with single dorsal tooth. Urosome 2 with paired dorsal teeth and single spine. Anterior head lobe broadly rounded, inferior antennal notch sharply incised. Antenna regular, not elongate.

Upper lip shallowly notched. Lower lip broad, processes normal; inner lobes well developed. Mandible, accessory blades few (6-10); left lacinia 4-dentate, right 3-dentate; palp segment 1 with medial acute process; segment 3 not longer than 2. Maxilla 1, inner plate acuminate, medial margin setose; outer plate with 9 apical spines; palp segment 1 with few lateral setae, outer segment broadened distally. Maxilla 2, inner plate with submarginal facial row, and distal oblique facial row of setae; outer plate with angled outer shoulder. Maxilliped, inner and outer plates relatively short; palp segment 2 columnar; dactyl medium.

Coxae 1-4 medium deep, rounded below, lacking posterior notch. Coxa 1 usually broadened distally. Gnathopod 1 weakly sexually dimorphic; palm oblique, margins finely spinose, dactyl normal. Gnathopod 2 (male), carpus short deep; propod, palm with hinge tooth variously developed; dactyl strong, with few (or none) outer marginal setae. Per-aeopod 5-7, bases large, regular; segment 4 of peraeopod 6 larger than in peraeopod 7; dactyls short to medium.

Pleon plate 3 produced acutely. Uropods 1 & 2, rami normally spinose, linear. Uropod 3, inner ramus very small, terminal segment or outer ramus small..

Telson lobes normal, slightly fused basally, proximal notch lateral; inner margins with weak spines.

Coxal gills 2-5 large; gill 6 variously smaller.
Female: Gnathopod 1, propod short, palm nearly vertical. Gnathopod 2, carpus medium short, hind margin setoso; propod short, palm smooth. Coxa 6, anterior lobe normal or bifid (in *D. transmelita*).

Taxonomic & Distributional Commentary. The genus *Desdimelita* is apparently confined to the North American Pacific coast. However, in the edentate pleon segments, and slender carpus and propod of gnathopod 1 (male), members of *Desdimelita* are similar to Asiatic Pacific members of the genus *Melita*.

Desdimelita appears transitional to genus *Melita* also in reduction of mouthpart setation, the palmar tooth of gnathopod 2 (male), and the terminal segment of the outer ramus of uropod 3. In the female of one species, the anterior lobe of coxa 6 is bifid, but not otherwise modified or hook-like.

Desdimelita desdichada (J. L. Barnard)
(Figs. 25, 26)

Melita desdichada J. L. Barnard, 1962: 110, fig. 22.—Barnard & Barnard, 1983: 664.—Austin, 1985: 610.—Staude, 1987: 384 (+ key).
Abludomelita desdichada Karaman, 1981: 40.

Material Examined. A total of 120 specimens at 28 stations, as follows:
ALASKA:
Southeastern Alaska, ELB Stn. A83 (Cordova Bay), June 30, 1961 - 1 male, 1 female.

BRITISH COLUMBIA:
North-central coast, ELB Stn. N1 (Open Bight), Aug. 3, 1959 - 1 male; Stn. N23b (Pendrell Sound), July 23, 1959 - 1 female.
ELB Stns., 1964: 3 localities - 1 female, 2 juveniles.
South-central coast, ELB Stn. EB8 (Burrard Inlet), 40 m. mud, June 16, 1976 - 1 female ov.; additional station, P. O'Rourke coll. - 1 male, 1 female;
ELB Stns., 1977-78: 7 localities in Burrard Inlet, 10-60 m. - 30 males, females, and juveniles.
Vancouver Island, north end, ELB Stns., 1959: V20 (Brown Bay) - 1 male (9.0 mm) (**figured**), 1 female, 2 juveniles; V3 (Nahwitti Bar) - 10 mostly male specimens.
Vancouver Island, south end, ELB Stns., 1970: P712 (David I., Trevor Channel), intertidal, bedrock, boulders, shelly sand, July 21 - 1 female ov. (5.5 mm) (**figured**).
ELB Stns.,1975: P12 (off Brady's Beach), 34 m.,muddy sand July 29 - 1 male, 1 female; P12 (Keeha Bay), 4-12 m., sand, Aug. 2 - 1 male, 6 juveniles; 6 additional localities, Berkley Sound region, intertidal - 24 m., bedrock, muddy sand, gravel - 14 male, female, and juvenile specimens.
ELB Stns., 1977: 3 stations off Brady's Beach, 10-30 m., sand, May-June - 6 males, 10 females.
K.E.Conlan coll., Saanich Inlet, 1976 - 25 specimens.
G. W. O'Connell Stn., off McCauley Pt., Victoria, 1977 - 1 male, 1 female.

Diagnosis. Male (9.0 mm). Urosome 1, postero-dorsal tooth single, strong. Urosome 2, postero dorsal paired teeth strong. Eye medium, rounded; inferior antennal notch narrow. Antenna 1, peduncle with 2-3 posterior marginal spines; peduncular segment 2 >segment 1; flagellum ~25 segments; accessory flagellum 5-segmented. Antenna 2, flagellum 10-segmented, segments nearly bare.

Mandible, spine row with 10-12 slender blades; palp segment 3 weakly setose. Maxilla 1, inner plate with 11 marginal setae; palp segment 1 with 3-4 lateral setae. Maxilla 2, inner plate with distal transverse facial row of 4-5 setae.

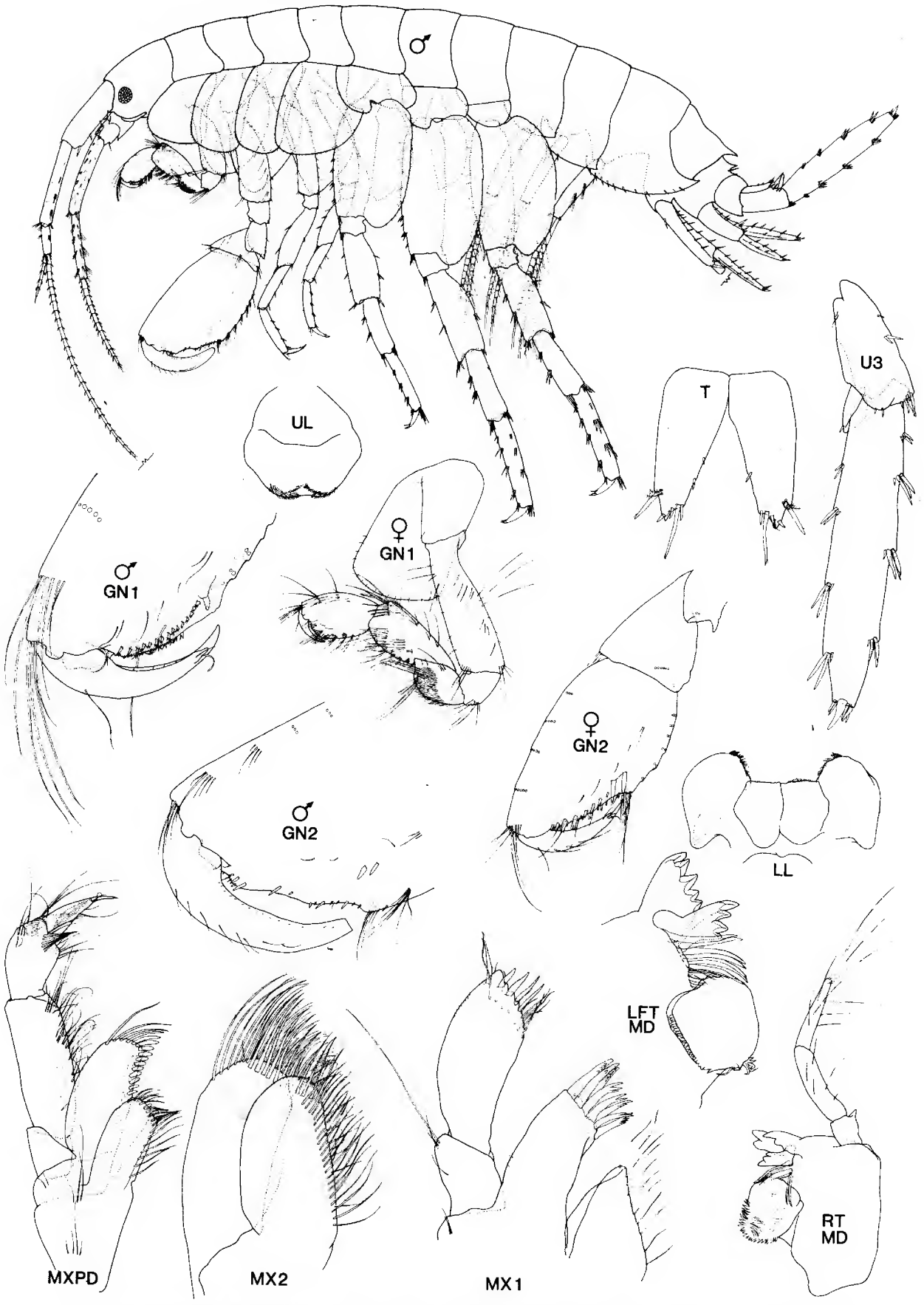

FIG. 25. ***Desdimelita desdichada*** **(J. L. Barnard). Brown Bay, Vancouver I. Male (9.0 mm); female (5.5 mm). Hanes I. (P712), Trevor Channel, B. C.**

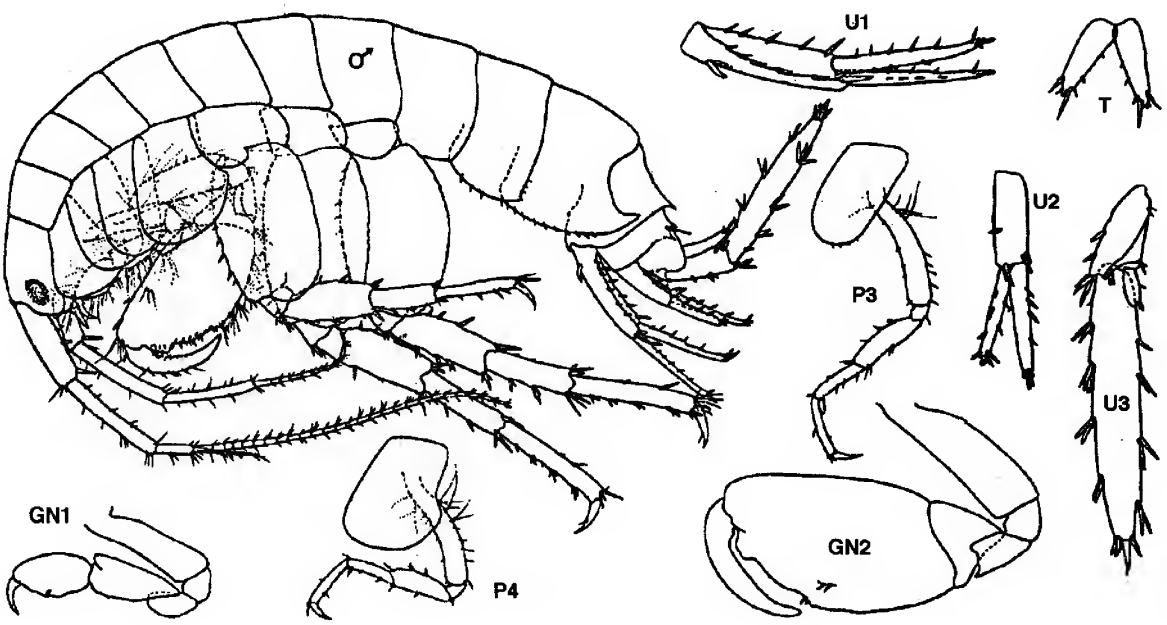

FIG. 26. ***Desdimelita desdichada*** **(J. L. Barnard). Central California coast. Male (7.0 mm). (after Barnard, 1969).**

KEY TO SPECIES OF *DESDIMELITA*

1. Urosome 2, postero-dorsal teeth small, inconspicuous; gnathopod 2 (male), palm of propod smooth, lacking hinge tooth; maxilla 2, inner plate lacking distal oblique row of facial setae . . . . . 2.

—Urosome 2, postero-dorsal teeth strong, conspicuous; gnathopod 2 (male), palm with hinge tooth variously developed; maxilla 2, inner plate with short distal oblique row of facial setae . . . . . 3.

2. Eye very small, round; coxa 6 (female), anterior lobe simple . . . . . *D. microphthalma*, n. sp. (p. 48)

—Eye of normal size; coxa 6 (female); anterior lobe bifid . . . . . *D. transmelita* n. sp. (p. 48)

3. Urosome 1 with 3 or 5 postero-dorsal teeth or cusps; gnathopod 1 (male) propod elongate . . . . . *D. californica* (Alderman) (p. 44)

—Urosome 1 with single postero-dorsal tooth; gnathopod 1 (male) propod normal . . . . . 4.

4. Telson lobes each with 2 long apical spines; peraeopods 3-7, dactyls long. *D.desdichada* (Barn.)(p. 40)

—Telson lobes with 0-1 long apical spines; peraeopod dactyls short (<1/4 segment 6) . . . . . 5.

5. Uropod 3, outer ramus elongate, straight, lateral margins with 6-7 clusters of spines; uropod 1, rami with 3 marginal spines; antenna 1, accessory flagellum 4-segmented . . . . . *D. barnardi* n. sp. (p. 46)

—Uropod 3, outer ramus ordinary, margins with 4 spine clusters; uropod 1, rami with 6 marginal spines; antenna 1, accessory flagellum 6-segmented . . . . . *D. microdentata* n. sp. (p. 44)

Maxilliped, inner plate with 8 marginal setae; outer plate short, 2/3 palp segment 2.

Coxa 1 medium broad distally. Coxa 4 nearly as broad as deep. Gnathopod 1, propod distinctly shorter than carpus, palm gently convex. Gnathopod 2, carpus, hind lobe narrow, deep; propod much longer than deep, palm oblique, with weak hinge tooth; dactyl heavy, lined with several outer marginal setae.

Peraeopods 3 & 4, dactyls relatively long, about 1/3 segment 6. Peraeopods 5-7, basis regular, subsimilar in

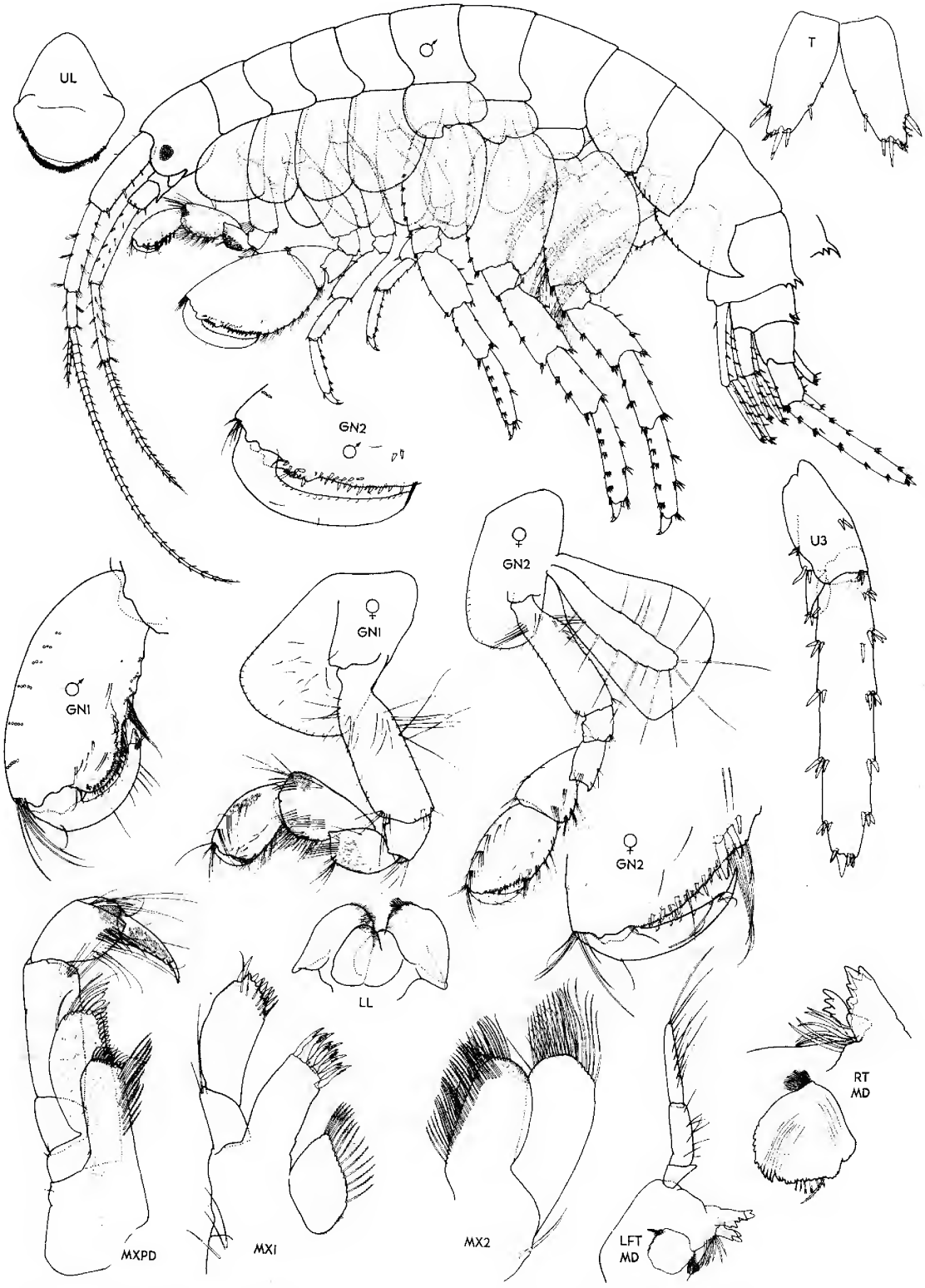

FIG. 27. *Desdimelita californica* (Alderman). Prince of Wales I., southeastern Alaska. Male (10.0 mm); female 7.0 mm).

form, dactyls relatively long,~ 1/4 segment 6. Peraeopod 5 segment 6 normal, not broadened.

Pleon segment 2, hind corner weakly acuminate; pleon 3, lower margin with 10+ short spines. Uropod 1, peduncle relatively short; rami with 4-6 marginal spines. Uropod 3, outer ramus with 4 groups of marginal spines; terminal segment medium.

Telson, subapical spines long, slender, inner margins with 1-2 small spines.

Coxal gills large, deep, subacute below; gill 6 smaller.

Female ov (7.0 mm). Gnathopod 1, propod short, deep, palm nearly vertidal. Gnathopod 2, palm oblique, nearly straight, strongly spinose, dactyl with outer marginal setae. Coxa 6, anterior lobe simple, not bifid.

Distributional Ecology. From Southeastern Alaska to Pt. Conception, California, on soft sediments at LW & subtidal depths, to ~120 m.

Taxonomic commentary. *Desdimelita desdichada* shows mainly plesiomorphic character states and is a primitive species of the genus.

Desdimelita californica (Alderman)
(Fig. 27)

Melita californica Alderman, 1936: 60, figs. 26-30.—Barnard & Barnard, 1983: 664.—Austin, 1985: 610.—Staude, 1987: 373 (key), 384.
Abludomelita californica (Alderman) Karaman, 1981: 40.

Material Examined. More than 1000 specimens in 53 lots, as follows:
SE Alaska, ELB Stns., 1961: A6 (East of Pt. Marsh, Prince Wales I.), intertidal, May 31 - 1 male (11.0 mm) (**figured**), female ov. (7.0 mm)(**figured**), ~200 additional specimens; 20 other localities, intertidal to 37 m., May-July - ~280 specimens. ELB Stns., July, 1980: 7 localitieS (S4B5, S5B1, S5B2, S5B8, S11B1, S11B2, S11B4), intertidal, boulders, slate, gravel - 78 male, female, juvenile specimens.

BRITISH COLUMBIA:
Queen Charlotte Islands, ELB Stns., July-August, 1957: 11 localities (incl. E21, W4a, W9), intertidal - ~75 specimens. North-central mainland, ELB Stn. N1 (Open Bight), intertidal Aug. 3, 1959 - 1 specimen. ELB Stns., July-August, 1964: 6 localities, intertidal - ~200 specimens. C. Levings Stn. L., 29 m, Swanson Bay, April, 1973 - 3 specimens.
South-central mainland, ELB Stn. V8 (off Spanish Banks, Burrard Inlet, 3-8 m, July 4, 1978 - 1 specimen.
Vancouver Island, north end, ELB Stns., June-August, 1959: 9 localities (incl. O1, O11, V19), intertidal - 26 specimens. Vancouver Island, south end, ELB Stns., July-August, 1955: 8 localities, intertidal - 47 specimens. ELB Stns., July-August, 1970: 11 localities (incl. P702, P709, P710, P714, P715, P718, P719, P721), intertidal - ~ 100 specimens. ELB Stns., June-July, 1976: 4 localities intertidal - 25 specimens. ELB Stns., May-June, 1977: 3 localities - 30 specimens.

WASHINGTON:
ELB Stns., July, 1966: 3 localities (W34, W35, W36) (Clallam Co.), intertidal - 10 specimens. R. M. O'Clair St. 7400 04 (Friday Harbor), 1976 - 4 specimens.

OREGON:
ELB Stn. W58 (Seal Rocks), intertidal, bedrock, sand, Aug. 13, 1966 - 2 specimens.

Diagnosis. Male (10.0 mm). Urosome segment 1, posterodorsal tooth slender, with pair of smaller denticles on each side. Urosome 2, postero-dorsal paired teeth strong, each encompassing single spine. Eye relatively small, rounded; inferior antennal notch relatively broad. Antenna 1, peduncle with 3-4 posterior marginal spines; segment 2 ~ segment 1; flagellum ~30 segments; accessory flagellum 5-segmented. Antenna 2, flagellum 15-segmented, segments weakly setose.

Mandible, spine row with 7-8 slender blades; palp segment 3 moderately strongly setose. Maxilla 1, inner plate with 12-14 marginal setae; palp segment 1 with 2 lateral setae. Maxilla 2, inner plate with distal transverse facial row of 6 setae. Maxilliped, inner plate with 10-11 inner marginal setae; outer plate short, 2/3 palp segment 2.

Coxa 1 medium, distally broad, nearly as wide as deep. Coxa 4 relatively narrow, deep. Gnathopod 1, propod slender, a little shorter than carpus, palm strongly oblique, strongly convex, finely spinose. Gnathopod 2, carpus, hind lobe narrow, deep; propod a little longer than deep, palm oblique, slightly convex, with low hinge tooth; dactyl heavy, lacking outer marginal setae, inner margin lined with several minute setules.

Peraeopods 3 & 4 distinctly unequal; dactyls short, length about 1/4 segment 6. Peraeopods 5-7, bases somewhat unlike; dactyls short, ~<1/5 segment 6. Peraeopod 5, basis distinctly shorter, relatively broad; segment 6 slightly broadened.

Pleon segment 2 hind corner squared; pleon 3, lower margin with ~6 short spines. Uropod 1, peduncle relatively long; rami with 3-5 marginal spines. Uropod 3, outer ramus with 4-5 groups of marginal spines; terminal segment very short.

Telson, subapical spines short, inner margins with 2 unequal small spines.

Coxal gills large, saclike, rounded below; gill 6 a little smaller, narrower.
Female ov (7.0 mm). Gnathopod 1, carpus relatively short, deep; propod short, deep, palm nearly vertical. Gnathopod 2, propod relatively small; palm oblique, slightly convex, unevenly spinose; dactyl with 2-3 outer marginal setae. Coxa 6, anterior lobe simple, not bifid.

Distributional Ecology. Aleutian Island chain south to central California, in cobbles and fine sediment, from LW to deep subtidal levels.

Taxonomic commentary. *Desdimelita californica* exhibits mainly plesiomorphic character states.

Desdimelita microdentata, new species
(Fig. 28)

Material Examined. About 500 specimens in 70 lots, as follows:
ALASKA:
Southeastern Alaska, ELB Stns., May-June, 1961: 13 local-

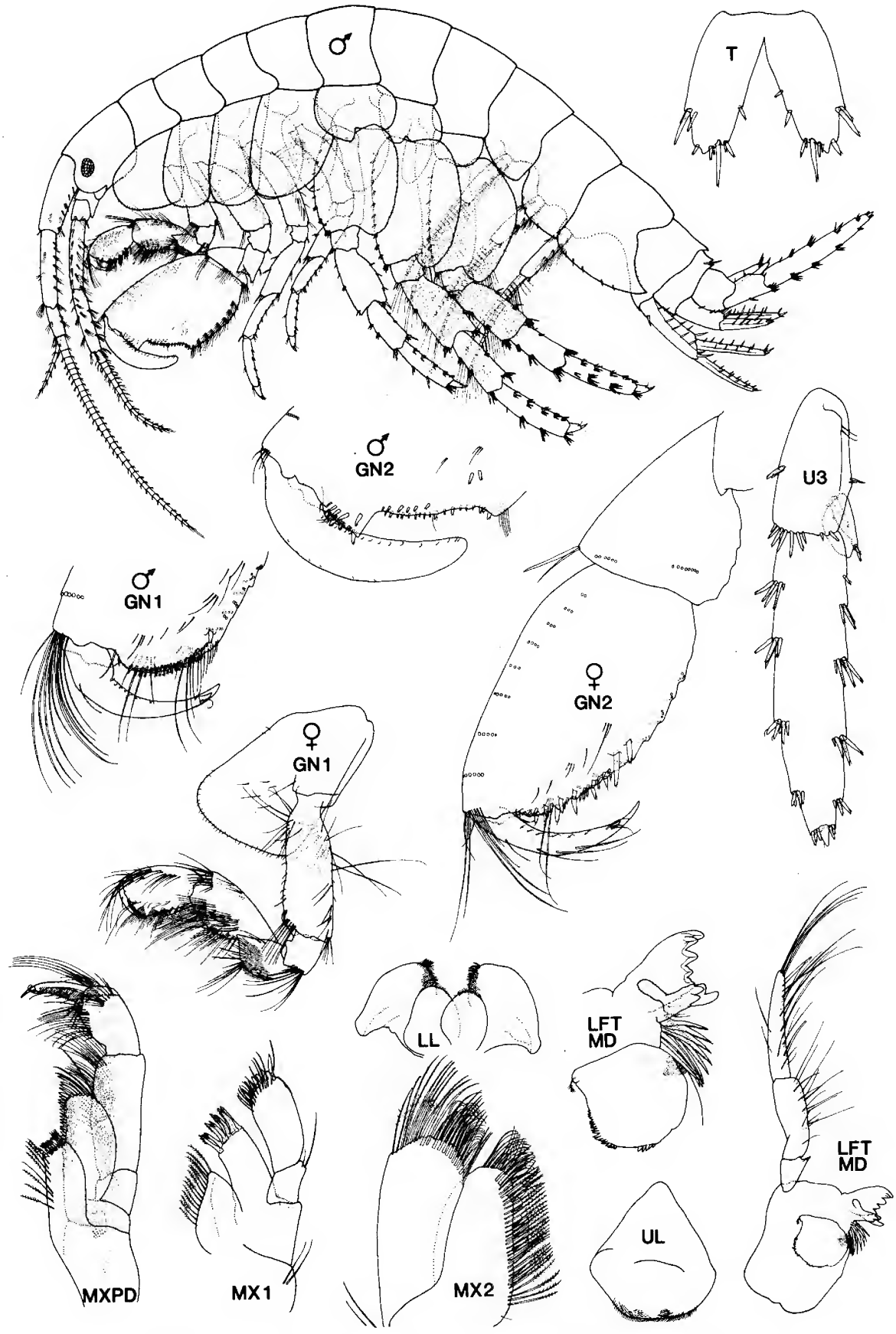

FIG. 28. ***Desdimelita microdentata,*** **new species. Kalaloch Beach (W24), WA. Male (11.0 mm); female (9.0 mm).**

ities (A2, A8, A15, A19, A20, A23, A57, A68, A71, A75, A80, A83, A129) - 93 males, females, juveniles. ELB Stns., July, 1980: 6 localities (S5B1, S5B2, S11B1, S11B2, S11B4), intertidal, slate, gravel, - ~100 males, females, juveniles.

BRITISH COLUMBIA:
Queen Charlotte Islands, ELB Stns., July-August, 1957: E17, E25, N2a, H14, W1 - 40 males, females.
North-central mainland, ELB Stns., July, 1964: H1, H10, H35, H40, H41 - 30 male, female, and juvenile specimens. Vancouver Island, south end, ELB Stns., August, 1955: F2, F4, F6a, P6a, P6c - 5 males, 4 females; ELB Stns., July-August, 1970: P702, P707, P714, P715, P716, P719, P721 - 65 male, female and juvenile specimens. ELB Stns., July-August, 1975: P5d, P18b, P20a, P22, P29a - ~200 males, females, juveniles. ELB Stns, June-July, 1976: B3, B7, B13, B20, B27, intertidal to 30 m. - 55 specimens. ELB Stn. B11b (Wickaninnish Bay), intertidal, May 23, 1977 - 1 male, 1 female.
J. F. L. Carl Stn., Bazan Bay, July 19, 1955 - 3 males, 3 females. D. V. Ellis Stn., Cadboro Bay, Oct. 23, 1965 - 2 males, 2 females. K. E. Conlan Stns., Saanich Inlet, 1976 - 1 juvenile. R. M. O'Clair Stns., 1976: Galiano Island, June 20, 1976 - 3 males, 2 females; Port McNeil, June 26 - 2 females.

WASHINGTON:
ELB Stns., 1966: W24 (Kalaloch Beach), intertidal, fine dark sand, July 23 - 1 male (11.0 mm) **Holotype**, 1 female ov. (9.0 mm) **Allotype**, ~100 male and female **Paratypes**; 4 other localities (W22, W34, W35, W40) - 16 male and female specimens. CMN collections, Ottawa.

OREGON:
ELB Stns., August, 1966: 5 localities (W50, W53, W57, W58, W63) - 23 male, female, and juvenile specimens.

Diagnosis. Male (11.0 mm). Urosome 1, postero-dorsal tooth very small, single. Urosome 2, postero-dorsal paired teeth medium, each encompassing single slender spine. Head, eye medium, subovate; inferior antennal notch small, narrow. Antenna 1, peduncle with 5-6 posterior marginal spines; segment 2 ~ segment 1; flagellum with 30+ segments; accessory flagellum 6-segmented. Antenna 2, flagellum ~12-segmented, segments moderately setose.

Mandible, spine row with 10-11 slender blades; palp segment 3 regularly strongly setose. Maxilla 1, inner plate with 12-14 marginal setae; palp segment 1 with 1-2 lateral setae. Maxilla 2, inner plate with distal oblique facial row of 3-4 setae. Maxilliped, inner plate with 6-8 inner marginal setae; outer plate short, 2/3 palp segment 2.

Coxa 1 medium, distally broad, nearly as wide as deep, broadly rounding anteriorly. Coxa 4 medium, deeper than broad. Gnathopod 1, propod slightly broadening distally, a little shorter than carpus; palm moderately oblique, gently convex, lined with numerous fine spines. Gnathopod 2, carpus, hind lobe very narrow, deep; propod very large, a little longer than deep, palm oblique, slightly convex, with strong hinge tooth; dactyl attenuated distally, lacking outer marginal setae, inner margin proximally with minute setules. Peraeopods 3 larger than 4; dactyls short, length ~ 1/4 segment 6. Peraeopods 5-7, bases broad, slightly dissimilar; dactyls short, ~<1/5 segment 6. Peraeopod 5, segment 6 slightly broadened.

Pleon segment 2, hind corner slightly acuminate; pleon 3, lower margin with ~6 short spines. Uropod 1, peduncle relatively short; rami with 5-6 marginal spines. Uropod 3, outer ramus relatively broad, with 4-5 groups of marginal spines; terminal segment very short.

Telson, subapical spines mainly short with 1 longer spine at inner notch, inner margins with 1-2 unequal short spines.

Coxal gills large, saclike, narrowing and rounded; gill 6 very much smaller and narrower.

Female ov. (9.0 mm). Gnathopod 1, carpus regular, deep; propod regular, palm gently convex, nearly vertical. Gnathopod 2, propod regular, palm oblique, unevenly convex, unevenly spinose; dactyl with 2-3 long outer marginal setae and several inner marginal setules. Coxa 6, anterior lobe simple, shallow, not bifid.

Etymology. From the Greek root "mikros" (small), and the Latin "dens - dentis" (tooth), referring to the relatively small postero-dorsal teeth on urosome segments 1 & 2.

Distributional Ecology. From southeastern Alaska to central Oregon, in depths from the low intertidal to ~35 m.

Taxonomic commentary. *Desdimelita microdentata* also demonstrates mainly plesiomorphic character states, and is most closely related to the primitive *desdichada-californica* complex of species.

Desdimelita barnardi, new species.
(Fig. 29)

Material Examined.
BRITISH COLUMBIA:
Vancouver I, south end, ELB Stn. P5d (Taylor I., Trevor Channel), intertidal, under stone, July, 1975 - male (8.0 mm) **Holotype** (single specimen). CMN collections, Ottawa.

Diagnosis. Male (8.0 mm). Urosome 1 virtually smooth mid-dorsally. Urosome 2, postero-dorsal paired teeth strong, each encompassing single short spine. Eye relatively large, rounded; inferior antennal notch medium. Antenna 1, peduncular segment 1 with 4-5 posterior marginal spines; segment 2 ~ segment 1; flagellum with ~25 segments; accessory flagellum 4-segmented. Antenna 2, flagellum ~12-segmented, segments sparsely setose.

Mandible, spine row with 8-9 slender blades; palp segment 3 regularly moderately setose. Maxilla 1, inner plate with 12 marginal setae; palp segment 1 with 1-2 lateral setae. Maxilla 2, inner plate lacking distinct distal oblique facial row of setae. Maxilliped, inner plate with ~12 inner marginal setae; outer plate short, 2/3 palp segment 2.

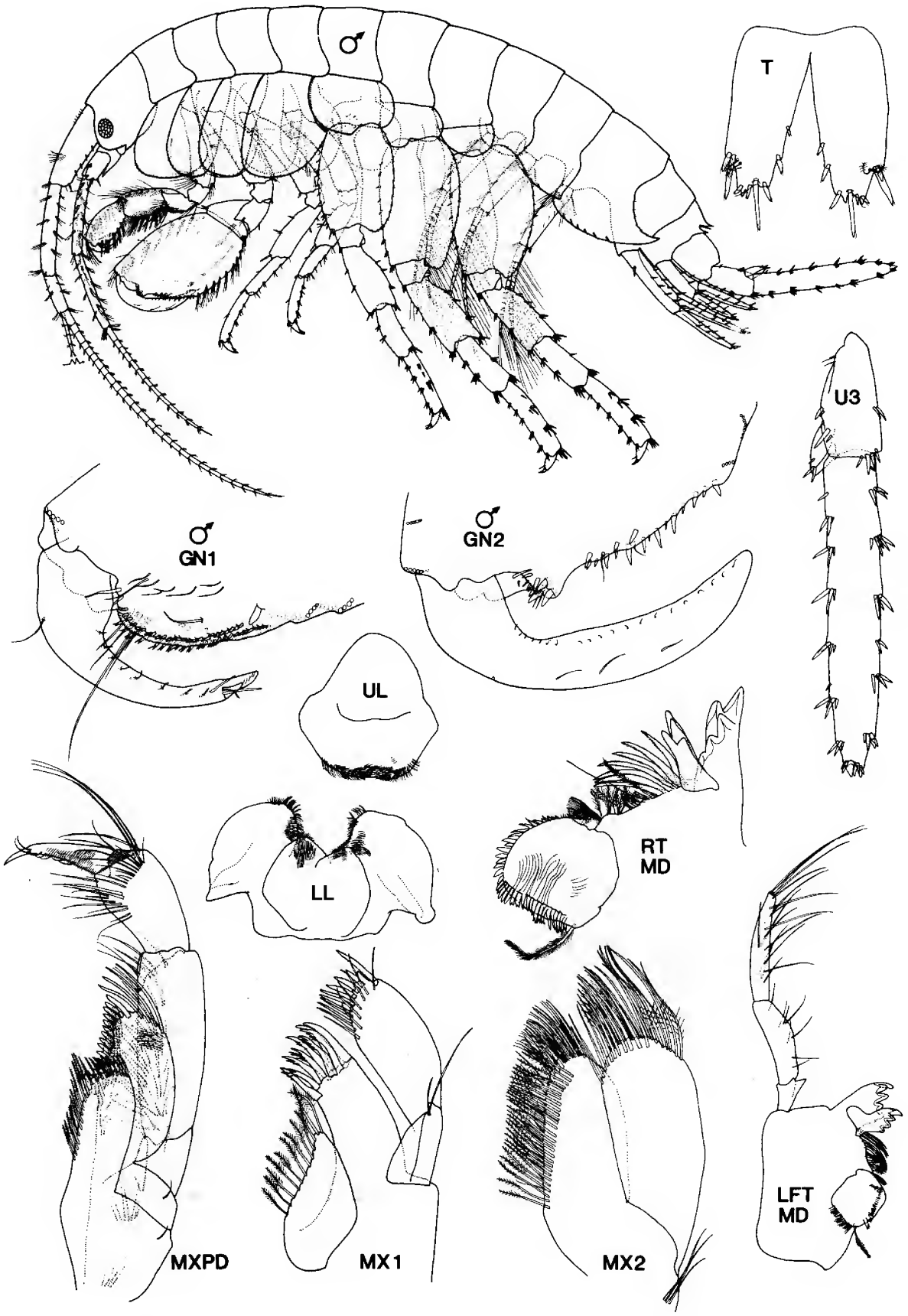

FIG. 29. ***Desdimelita barnardi,*** **new species. Trevor Channel (P5), B. C. Male (8.0 mm).**

Coxa 1 medium distally broad, nearly as wide as deep, gently rounding anteriorly. Coxa 4 narrow, deeper than broad. Gnathopod 1, propod slender, a little shorter than carpus; palm very oblique, strongly convex near hinge, lined with very fine fork-tipped spinules. Gnathopod 2, carpus, hind lobe narrow, deep; propod large, a little longer than deep, palm oblique, unevenly convex, with strong hinge tooth; dactyl heavy, thick, with few outer marginal setae, inner margin lined with minute setules. Peraeopod 3 larger than 4; dactyls medium, length < 1/4 segment 6. Peraeopods 5-7, basis broad, slightly dissimilar, basis of peraeopods 6 & 7 narrowing distally to relatively small hind lobes; dactyls medium,~ 1/4 segment 6. Peraeopod 5, segment 4 slender.

Pleon segment 2, hind corner slightly acuminate; pleon 3, hind corner strongly produced, acute, lower margin with ~6 short spines. Uropod 1, peduncle relatively short; rami with 3-4 marginal spines. Uropod 3, outer ramus relatively long, margins subparallel, each with 6-7 groups of spines; terminal segment very small.

Telson lobes relatively large, each with 2 longish subapical spines, inner margins with 2 short spines.

Coxal gills broadly saclike, rounded below; gill 6 distinctly smaller and narrower.

Female unknown.

Etymology. The species is named in honour of the late J. L. (Jerry) Barnard who contributed very broadly to knowledge of melitid amphipods and described the type species of the genus *Desdimelita.*

Distribution. Known only from type locality

Taxonomic commentary. The species is moderately advanced, but is more closely related to primitive members within the genus.

Desdimelita microphthalma, new species
(Fig. 30)

Material Examined.
ALASKA:
Southeastern Alaska, ELB Stn. S5B1 (Hogan I.), intertidal, slaty gravel, July 28, 1980 - male (6.0 mm) **Holotype**, female ov. (4.5 mm) **Allotype**, 2 male, 2 female, **Paratypes.** CMN collections, Ottawa.

Diagnosis. Male (8.0 mm). Urosome 1 with ordinary single postero-dorsal cusp. Urosome 2, postero-dorsal paired teeth small, each encompassing single short spine. Eye very small, rounded; inferior antennal notch relatively large, open. Antenna 1, peduncle 1 with 2 proximal posterior marginal spines, segment 2 ~ segment 1; flagellum relatively short, with ~16 segments; accessory flagellum 5-segmented. Antenna 2, flagellum short, with ~8 moderately setose segments.

Mandible, spine row with 8-9 slender blades; palp segment 3 weakly setose. Maxilla 1, inner plate with 9 marginal setae; palp segment 1 with 2-3 shoulder setae. Maxilla 2, inner plate lacking distinct distal oblique facial row of setae. Maxilliped, inner plate with 8-9 inner marginal setae; outer plate medium, >2/3 palp segment 2.

Coxa 1 medium, distally broad, deeper than wide, rounding anteriorly. Coxa 4 medium, deeper than broad. Gnathopod 1, propod short, broadening distally; palm regularly oblique, convex near hinge, lined distally with fork-tipped spinules; dactyl distally attenuated. Gnathopod 2, carpus, hind lobe narrow, deep; propod large, a little longer than deep, palm oblique, unevenly convex, with strong hinge tooth; dactyl heavy, thick, with few outer marginal setae, inner margin lined with minute setules. Peraeopod 3 larger than 4; dactyls medium, length < 1/4 segment 6. Peraeopods 5-7, basis broad, slightly dissimilar, that of peraeopods 6 & 7 narrowing distally to relatively small hind lobes; dactyls medium,~ 1/4 segment 6. Peraeopod 5, segment 4 slender.

Pleon segment 2, hind corner slightly acuminate; pleon 3, hind corner strongly produced, acute, lower margin with ~6 short spines. Uropod 1, peduncle relatively short; rami with 3-4 marginal spines. Uropod 3, outer ramus relatively long, margins subparallel, each with 6-7 groups of spines; terminal segment very small.

Telson lobes relatively large, each with 2 longish subapical spines, inner margins with 2 short spines.

Coxal gills broadly saclike, rounded below; gill 6 distinctly smaller and narrower.

Female ov.(9.0 mm). Gnathopod 1, propod slightly narrower, palm more vertical but less strongly lined with spinules, and dactyl less basally swollen, than in male. Gnathopod 2, propod relatively small, little larger than carpus, palm oblique, nearly straight. Coxa 6, anterior lobe shallow, unmodified.

Etymology. From the Greek roots words "mikros" (small) and "ophthalmos" - eye, with reference to the small pigmented eye.

Distributional Ecology. Known only from the type locality, Hogan Island, southeastern Alaska.

Taxonomic commentary. About half the character states of *Desdimelita microphthalma* are apomorphic, making it one of the most advanced species of the genus.

Desdimelita transmelita, new species
(Fig. 31)

Material Examined.
BRITISH COLUMBIA:
Vancouver Island, south end, ELB Stn. B21a (off Brady's Beach), 16-30 m., sand, June 1, 1977 - female ov. (6.0 mm) **Holotype**; Stn. B21b (off Brady's Beach), 10-20 m., sand - 1 male subadult (5.5 mm) **Allotype**. No other specimens. CMN collections, Ottawa.

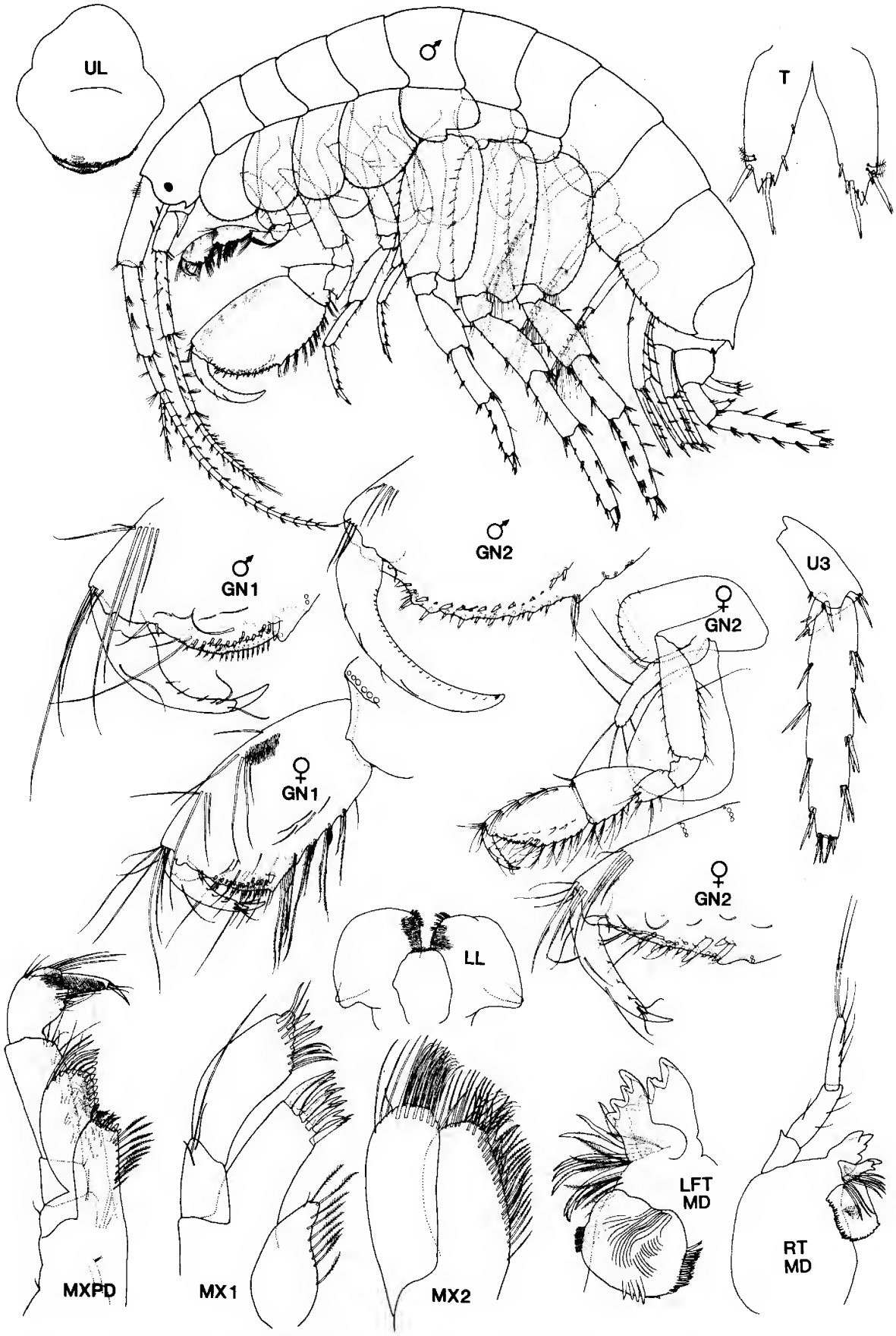

FIG. 30. ***Desdimelita microphthalma*****, new species. Hogan I. (S5B1), southeastern Alaska. Male (6.0 mm); female (4.5 mm).**

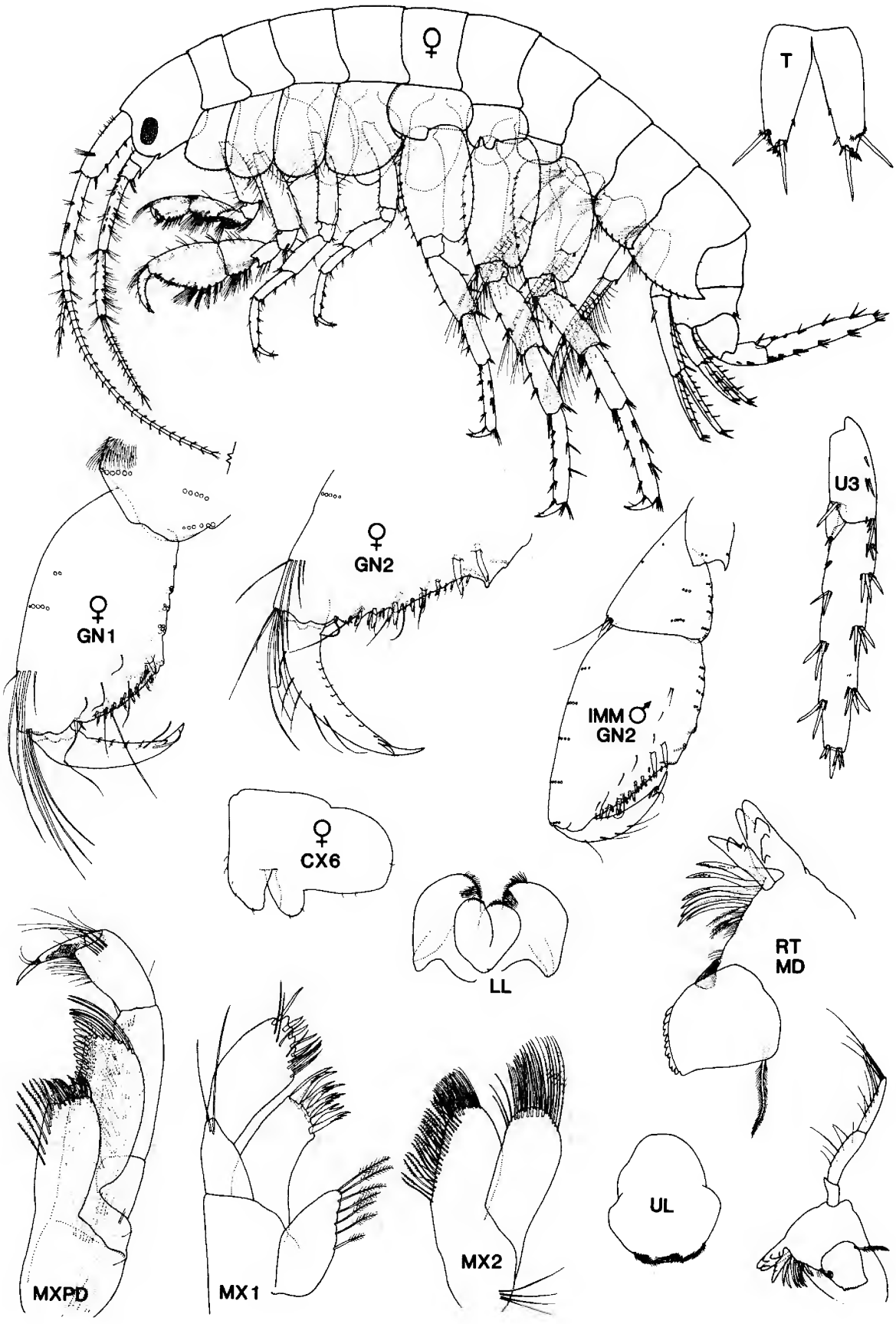

FIG. 31. ***Desdimelita transmelita,*** **new species. Off Brady's Beach, British Columbia. Female (6.0 mm); subadult male (5.5 mm).**

Diagnosis. Female ov. (6.0 mm). Urosome 1 lacking postero-dorsal cusp. Urosome 2, postero-dorsal paired teeth small, each encompassing single spine longer than teeth. Eye somewhat oval, elongate. Inferior antennal notch small. Antenna 1, peduncle 1 with 3-4 proximal posterior marginal spines; segment 2 >segment 1; flagellum medium, with 20+ segments; accessory flagellum 4-segmented. Antenna 2, flagellum short, with ~8 moderately setose segments.

Mandible, spine row with 8-9 slender blades; palp segment 3 moderately setose. Maxilla 1, inner plate with 7 marginal setae; palp segment 1 with 2 lateral setae, segment 2 very broad, apically shallowly dentate. Maxilla 2, inner plate with distal oblique row of 3 setae. Maxilliped, inner plate with 6-7 inner marginal setae; outer plate medium, >3/4 palp segment 2.

Coxa 1 very little expanded distally. Coxa 4 narrow, deeper than broad. Gnathopod 1, carpus a little longer than propod; propod little longer than deep, palm oblique, nearly straight; dactyl with short inner marginal setules. Gnathopod 2, carpus, hind lobe narrow, deep; propod large, longer than deep, palm oblique, nearly straight, very weakly toothed near hinge; dactyl heavy, thick, with 3-4 outer marginal setae, inner margin lined with minute setules; unguis distinct.

Peraeopod 3 larger than 4; dactyls relatively long, <1/3 segment 6. Peraeopods 5-7, basis regularly broad, similar, not narrowing distally, hind lobes regular; dactyls medium,~ 1/4 segment 6. Peraeopod 5 not markedly smaller than 6 & 7; segment 4 slender, not expanded. Coxa 6, anterior lobe bifid, each lobe rounded (not sexually modified) below.

Pleon segment 2, hind corner slightly acuminate; pleon 3, hind corner moderately produced, acute, lower margin with ~8 medium spines. Uropod 1, peduncle relatively short; rami with 4-5 marginal spines. Uropod 3, outer ramus regular, margins each with 4 groups of spines; terminal segment medium, slender.

Telson lobes relatively long, each with 2 longish subapical spines, inner margins with 1-2 short spines.

Coxal gills broadly saclike, rounded below; gill 6 distinctly smaller and narrower.

Subadult male (5.5 mm). Gnathopods 1 & 2 similar to those of adult female.

Etymology. The species name is derived from the Latin "trans" (across) and the generic root *"Melita"*, with reference to its intermediate position between the *Abludomelita* and *Melita* generic complexes.

Distributional ecology. Known only from off Brady's Beach, Trevor Channel, Vancouver Island, B. C.

Taxonomic commentary. *Desdimelita transmelita* appears somewhat transitional to the Asiatic subgroup of *Melita,* mainly because of the bifid anterior lobe of coxa 6. Regrettably, gnathopod 1 of the mature male that would provide further evidence of full generic relationships, is unknown.

Melita Leach

Melita Leach, 1814: 403.—Karaman, 1981: 41.
Caliniphargus Stout, 1913: 640.
non *Megamoera* Bate, 1862: 224.

Type species: *Cancer palmatus* Montagu, 1804 (monotypy)

Species.

1. World. (a) Typical, with dorsal tooth on urosome 1 (*otherwise aberrant): *Melita celericula* Croker, 1971*; *M. dulcicola* Stock & Vonk, 1990*; *M. festiva* Chilton, 1885 (see Hurley, 1954); *M. gayi* Nicolet, 1849 (see also Schellenberg 1931); *M. hergensis* Reid, 1939 (see Ruffo, 1982, fig. 228); *?M. machaera* K.H.Barnard (see Griffiths, 1976); *M. orgasmos* K.H. Barnard, 1940 (see Ledoyer, 1979, fig. 12); *M. planaterga* Kunkel, 1910*; *M. plumulosa* Zeidler, 1989*; *M. reidi* Hamond, 1965; *M. solada* J. L. Barnard, 1961; *M. sulca* (Stout, 1913); *M. tristanensis* K. H. Barnard, 1965.

(b) Atypical, lacking dorsal tooth on urosome 1: *Melita awa* Barnard, 1972)*; *M. alluaudi* Ledoyer, 1982; *M. bulla* G. Karaman, 1978; *M. coronini* Heller, 1866; *M. elongata* Sheridan, 1980; *M. inaequistyla* (Dana, 1852); *M. intermedia* Sheridan, 1980; *M. laevidorsum* Stephensen, 1944b; *M. longisetosa* Sheridan, 1980; *?M. matilda* Barnard, 1972*; *M. mangrovae* Oliveira, 1953*; *M. lagunae* Oliveira, 1953; *M. nitida* Smith, 1873; *M. nitidula* Ruffo, 1958*; *M. oba* Barnard, 1972*; *M. pahuwai* Barnard, 1970; *M. valesi* S. Karaman, 1965*; *M. zeylanica* Stebbing, 1904 (see also Ledoyer, 1979; Griffiths, 1975); *M. zeyalanica kauerti* Barnard, 1972.

(c) Incerta sedis:

M. podager (M.-E., 1830) (no information available).

2. North Pacific species.

North American: *Melita alaskensis*, n. sp. (p. 53); *M. nitida* Smith, 1873 (see also Chapman, 1988); *M. oregonensis* Barnard, 1954; *M. sulca* (Stout, 1913) (see also Barnard, 1969b).

Asiatic: *Melita bingoensis* Yamato, 1987; *M. hoshinoi* Yamato, 1990; *M. koreana* Stephensen, 1944 (see also Yamato, 1987); *M. longidactyla* Hirayama, 1987; *M. nagatai* Yamato, 1987; *M. piloprotopoda* Hirayama, 1987; *M. quadridentata* Yamato, 1990; *M. rylovae* Bulycheva, 1955 (see also Yamato, 1987); *M. setiflagella* Yamato, 1988; *M. shimizui* (Ueno, 1940) (see also Yamato, 1988); *M. tuberculata* Nagata, 1965.

Diagnosis. Head, inferior antennal sinus variously incised, anterior and posterior lobes rounded. Pleon segments usually not (or very weakly) dorsally toothed. Urosome segment 1 with or without dorsal tooth. Urosome 2 with paired dorsal teeth and/or spine groups. Antennae strong; antenna 2, flagellar segments often ringed with "bottlebrush" setae.

Mandible, right lacinia spike-like, multidenticulate; left lacinia 4-dentate. Maxilla 1, outer plate with 9 (occasonally 6-7) apical spines; inner plate subtruncate, distal margin 4-10 setose; palp segment 1 lacking shoulder setae (usually), segment 2 disto-medially broadened, apex (of right palp) dentate. Maxilla 2, inner plate, with distal marginal setae only. Maxilliped plates strong; palp segment 2 sublinear; dactyl stout, curved.

Coxae 1-3 lacking hind marginal cusps; coxa 4 squarish or evenly rounded below. Gnathopod 1 (male), carpus slender, longer than propod, antero-distal lobe usually finely pilose (both sexes); propod slender, dactyl short, highly modified, with basal bulge or swelling. Gnathopod 2, propod postero-distally broadened, unproduced, inner face often strongly setose and distally excavate to accommodate tip of large acute dactyl; palmar margin usually lacking hinge tooth.

Peraeopods 3 & 4 variously unequal in size. Peraeopods 6 & 7 larger than 5, bases lobate; segment 4 variously broadened.

Coxa 6 (female), antero-ventral lobe modified, deep, often hook-like, pre-copulatory in function.

Pleon plate 3, hind corner squarish, acuminate or moderately produced. Uropod 3, inner ramus small, outer ramus strong, terminal segment usually lacking. Telson lobes separated to base, apices and inner margins spinose.

Coxal gill 6 various, often small.

Behavioural characteristics. The uniquely modified form of the propod palmar region and dactyl of gnathopod 1 (male), and modified anterior lobe of coxa 6 (female), have long been known taxonomically (e.g., Sars, 1895; Stebbing, 1906). Only relatively recently, however, has their pre-amplexing (mate-carrying) functional interrelationship been demonstrated and their phyletic relationship more fully appreciated (e.g., Borowsky, 1984; Conlan, 1991; Bousfield & Shih, 1994). This conspicuous morphological and behavioural feature is apparently characteristic of members of the genus *Melita* sens. str. and close allies, but is only partially, or not at all, developed in the *Abludomelita* complex of genera.

Taxonomic and biogeographical commentary. Karaman (loc. cit.) was fully justified in separating *Melita* and *Abludomelita* on both taxonomic and distributional bases. Regrettably, however, he did not correctly categorize some of the species included in this North Pacific study; thus the world-wide fauna should similarly be re-examined.

Members of the genus *Melita* are strikingly different from *Abludomelita* and related generic complexes in characters above. *Melita* and related genera are Gondwana relict groups whose members are tropical and warm temperate, with relatively limited penetration into the North Atlantic and North Pacific regions.

Yamato (1990) agrees with Zeidler (1989) that the presence or absence of a terminal segment of uropod 3 is of no generic significance. As Yamato (loc. cit.) further intimated, we are here formally diagnosing genera on the basis of numerous character states, in which presence or absence of a terminal segment of uropod 3 may be, in combination with other states, a generically definitive taxonomic feature.

Melita oregonensis J. L. Barnard
(Figs. 32, 33)

Melita oregonensis Barnard, 1954: 19, pls. 18-20.—Karaman, 1981: 41.—Austin, 1985: 610.—Staude, 1987: 384.—Barnard & Barnard, 1983: 665 .

Material Examined.

ALASKA:

Southeastern Alaska, ELB Stns., 1961: A147 (southwest of Pt. Gilmour, Montagu I.), intertidal, rock, boulders, July 14 - male (9.0 mm) (**figured**), female ov. (7.0 mm) (**figured**); also A3, A6, A46, A54, A151, A168 - 55 specimens. ELB Stns., July-Aug., 1980: 7 localities (incl. S5B1) - 40 spmns.

BRITISH COLUMBIA:

Queen Charlotte Islands, ELB Stns., July-August, 1957: W2, W4b, H3, H7, H14, E25 - 66 specimens. G. C. Carl Stn., Anthony I., Oct. 17, 1956 - 2 specimens.

North-central mainland, ELB Stns., July-August, 1964: H1, H12, H53, H59, H65 - 18 specimens.

Vancouver Island, north end, ELB Stns., 1959: O4b, O11, O15 - 18 specimens. Vancouver Island, south end, ELB Stns., July, 1970: P710, P714, intertidal - 16 specimens. ELB Stns., July-Aug-ust, 1975: P3a, P17d, P18a, P20a, P21a, P29a, intertidal to 14 m., sand, gravel - 18 specimens. ELB Stns., July, 1976: B3, B7, B28, intertidal - 60 specimens. ELB Stn. B6a, May, 1977- 1 specimen.

WASHINGTON:

ELB Stns., 1966: W35 (Agate Beach), intertidal, sand, gravel, July 28 - 15 specimens; W40 (Mukkaw Bay at Sooes Pt.), fine sand, shelly sand, July 31 - 6 specimens.

Diagnosis. Male (9-12 mm). Anterior head lobe rounded, with squarish inferior incision, lower lobe rounded. Urosome 1 smooth dorsally; urosome 2 with 2 dorso-lateral teeth on each side, on each side of a single short slender spine. Antennae large, peduncles stout, setose. Antenna 1, proximal posterior margin of peduncular segment 1 with 3-4 short spines; segment 3 long (~1/2 segment 2); flagellum with 20-30 segments; accessory flagellum 3-4 segmented. Antenna 2, flagellum 12-14 segmented, each with whorl of short setae

Lower lip, inner lobes medium, distinct. Mandible, spine row with 6-8 blades; palp segments 2 & 3 moderately setose. Maxilla 1, inner plate with 8-10 plumose setae; palp segment 2 medially broadened, right palp apically with setae, short spines and 2-3 teeth; segment 1 marginally bare. Maxilla 2, inner margin of inner plate lined with 8-9 setae. Maxilliped, inner plate with 12-14 inner marginal setae, apex truncate; outer plate, inner margin with numerous (20-25) chisel teeth lengthening distally to strong, curved slender spines; palp strong, segment 2 columnar.

KEY TO EASTERN NORTH PACIFIC SPECIES OF *MELITA* SENS. STR.

1. Urosome 1 with dorsal tooth; uropod 2, rami subequal; telson lobes each distally with 3-4 long spines, gnathopod 1 (male), dactyl minute, masked distally by propod . . . . . *M. sulca* (Stout) (p. 59)
—Urosome 1 smooth above; uropod 2, outer ramus distinctly the shorter; telson lobes each distally with short spines or 1-2 long spines; gnathopod 1, dactyl fully visible beyond propod . . . . . 2.

2. Urosome 2, posterodorsal margin with short spines only; coxa 4 very broad, lower margin straight; peraeopods 6 & 7, bases narrowing distally to small hind lobes; telson with short apical spines; antenna 2 (male), flagellum with strong "bottle brush" setae. . . . . *M. nitida* Smith (p. 57)
—Urosome 2, posterodorsal margin with pairs of small teeth surrounding single spines or not; coxa medium broad, lower margin rounded; peraeopods 6 & 7, bases not narrowing distally, hind lobes normal; telson lobes each with 1-2 long apical spines; antenna 2 (male) flagellar segments normally setose . 3.

3. Pleon plate 3, hind corner acutely produced, weakly serrate below; telson apices with 2 long spines; peraeopod 5, segment 4 broadened, width > 1/2 length . . . . . *M. oregonensis* J. L.Barnard (p. 52)
—Pleon plate 3, hind corner squarish, acuminate; telson apices with single long spine; peraeopod 5, segment 4 little broadened, width < 1/2 length . . . . . *M. alaskensis* n. sp. (p. 53)

Coxae 1-4 medium, uniformly deep, rounded below. Coxa 1 broadened distally. Gnathopod 1, basis antero-distally setose; carpus slender, sublinear; propod shorter, anterior margin convex, distally overhanging base of short, basally bulging dactyl that closes on short, oblique, finely spinose palm. Gnathopod 2, basis with few antero-distal setae; carpus short, deep, length of posterior lobe about half anterior margin; medial face of propod with large richly setose distal depression; palm regularly convex, oblique, setose and spinulose; dactyl relatively short.

Peraeopod 3 distinctly larger than 4, dactyls short. Peraeopods 6 & 7 larger than 5; coxae distinctly anterolobate; bases broad, smoothly convex behind, lower lobes shallow but distinct. Peraeopod 5, segment 4 stout, moderately broadened. Peraeopods 6 & 7, segment 4 longer than 5; segment 6, margins spinose; dactyls short.

Pleon plate 3, hind corner moderately produced, acute, lower margin weakly serrate distally. Uropod 1, distal peduncular spine medium strong, outer ramus slightly shorter. Uropod 2, outer ramus short, margins strongly spinose. Uropod 3, inner ramus very small; outer ramus strong, about twice length of, and broader than, peduncle, margins with 5-6 clusters of medium slender spines, apex with short spines.

Telson lobes medium, narrowing distally, inner margins with 3-4 short spines, apices subacute, each with 2 strong spines, lateral notches evanescent.

Coxal gills on peraeopods 2-5 medium large, saclike; gill on peraeopod 6 distinctly smaller, less broad.

Female ov.(7-8 mm). Gnathopod 1, carpus relatively deep, lower margin convex; propod with regular, convex, nearly vertical palm; dactyl regular. Gnathopod 2 relatively small, carpus and propod shallow, subequal in length; palm oblique, nearly straight.

Coxa 6, anterior lobe forming a strong, sharply hooked process; stridulating ridges not observed.

Distributional ecology. From southeastern Alaska and British Columbia, south to Oregon and northern California, under rocks at LW level. mainly at outer coast localities, in summer temperatures of 12-17°C. and salinities of 30+‰.

Taxonomic commentary. *Melita oregonensis* is closely similar to *M. alaskensis* (below) but differs mainly in the form of gnathopod 1, and the larger gnathopod 2. Barnard (1954) noted its relatively close similarity to *M. nitida* Smith. It is quite unlike the dorsally dentate *M. sulca,* with which it overlaps distributionally in southern parts of its range, and the type species, *M. palmata* of western European waters. However, *M. oregonensis,* and *M. alaskensis,* cluster more closely with the Japanese complex of species (Fig. 41, p. 68).

Melita alaskensis, new species
(Fig. 34)

Material Examined.

ALASKA:

Southeastern Alaska, ELB Stns., 1961: A164 (Imperial Passage, northwest side of Hogan I.), under boulders at LW level, temperature 12.5° C., salinity 22.5‰, July 23 - male 7.5 mm) **Holotype**, female ov. (7.0 mm) **Allotype**, 3 male, 60 female, 7 juvenile **Paratypes**; A7 (Bostwick Bay), June 2 - 4 males, 1 female; A22 (near Sitka), June 2 - 1 female, 1 juvenile; A129 (Anchor Cove), July 10 - 3 males, 3 females; A151 (east of Johnstone Inlet), July 15 - 5 males, 5 females. CMN collections, Ottawa.

Diagnosis. Male (7.5 mm). Anterior head lobe rounded, with acute inferior incision, lower lobe rounded. Urosome 1 smooth dorsally; urosome 2 nearly smooth dorsally. Antennae large, peduncles stout, moderately short setose. Antenna 1, posterior margin of peduncular segment 1 with 4-5 medium spines; segment 3 long (~1/2 segment 2); flagellum with 20-25 segments; accessory flagellum with 3 1/2 segments. Antenna 2, flagellum with about 10 segments, each with whorl of short setae.

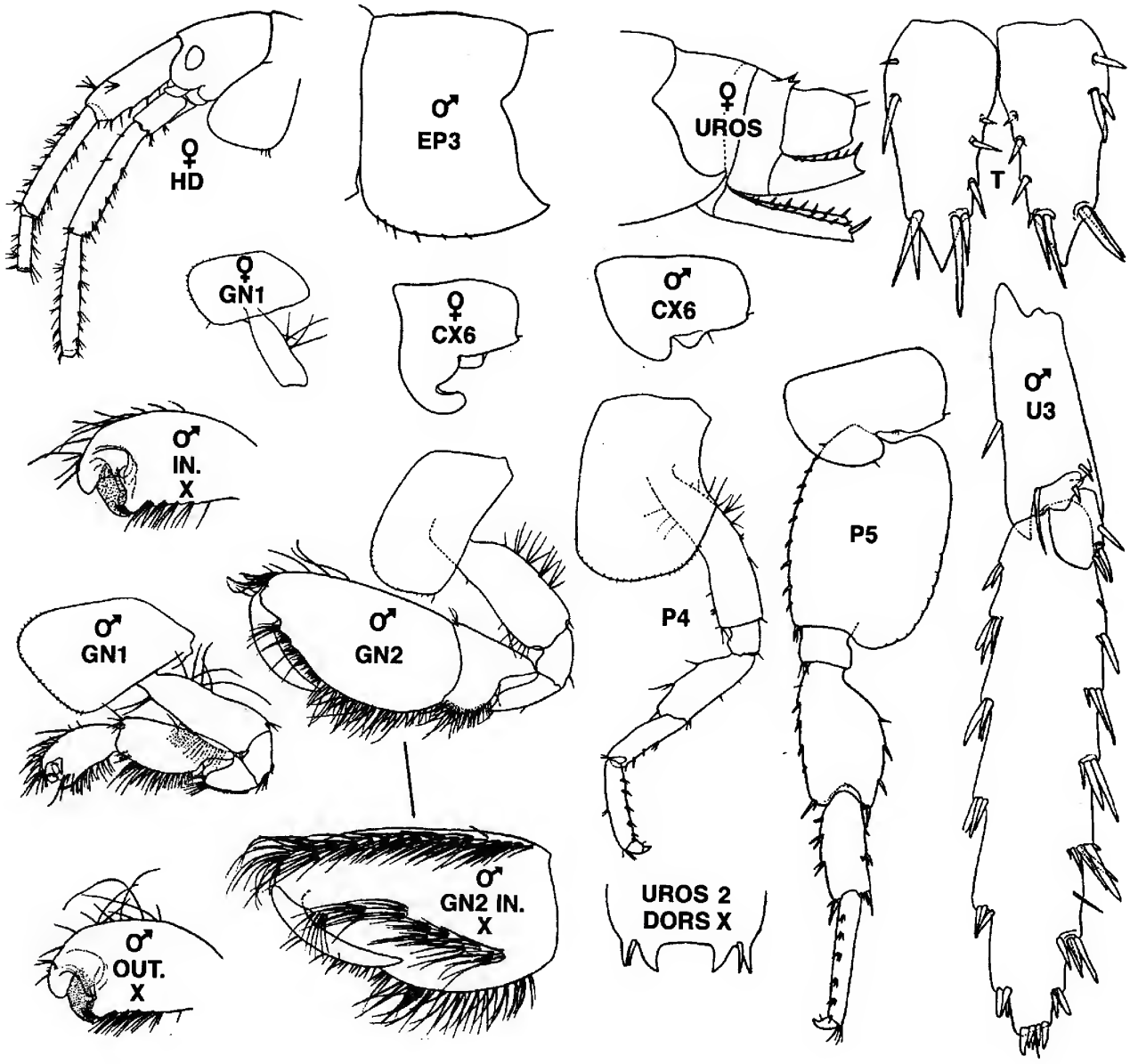

FIG. 32. *Melita oregonensis* Barnard, 1954. Coos Bay, Oregon. Male (12.0 mm); female (14.0 mm).

Lower lip, inner lobes medium, distinct. Mandible, spine row with 6-7 blades; palp segments 2 & 3 moderately setose. Maxilla 1, inner plate with 6-7 plumose setae; outer plate with 9 apical spines; palp segment 2 distally broadened, right palp apically with setae, slender spines and 4 teeth; segment 1 marginally bare. Maxilla 2, inner margin of inner plate lined with 8-9 setae, longest distally. Maxilliped, inner plate with 7-8 inner marginal setae, apex truncate; outer plate, inner margin with about 15 chisel teeth lengthening distally to about 6 strong, curved slender spines; palp strong, segment 2 columnar.

Coxae 1-4 medium large, uniformly deep, broadly rounded below. Coxa 1 broadened distally. Gnathopod 1, basis distal half of anterior margin strongly setose; carpus slender, sublinear; propod relatively short and deep, anterior margin markedly convex, distally strongly overhanging base of short, basally swollen dactyl, the unguis of which closes on a very short, oblique, finely spinose palm. Gnathopod 2 medium, basis nearly lacking anterodistal setae; carpus short, relatively shallow, length of posterior lobe more than half anterior margin; medial face of propod with long moderately setose distal groove; palm regularly convex, very oblique, richly spinulose; dactyl medium, inner margin lined with fine setules.

Peraeopod 3 slightly larger than 4; dactyls short. Peraeopods 6 &7 larger than 5; coxae distinctly anterolobate; bases broad, smoothly convex behind, lower lobes shallow but distinct. Peraeopod 5, segment 4 stout, moderately broadened. Peraeopods 6 & 7, segment 4 slightly longer and broader than 5; segment 6, margins spinose; dactyls very short.

Pleon plate 3, hind corner subtruncate, weakly acuminate,

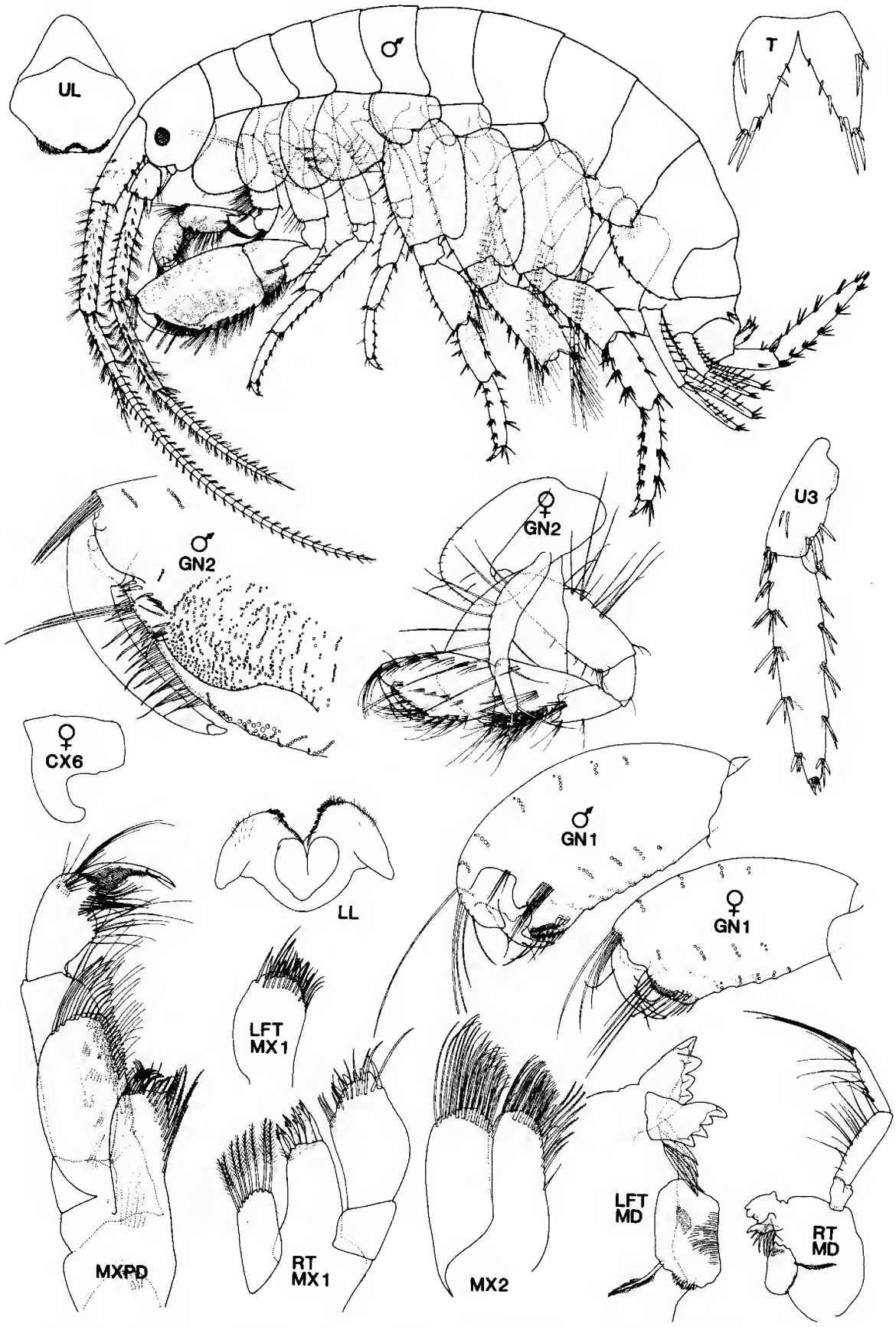

FIG. 33. ***Melita oregonensis*** **J. L. Barnard, 1954. Pt. Gilmour (A147), southeastern Alaska. Male (9.0 mm); female (7.0 mm).**

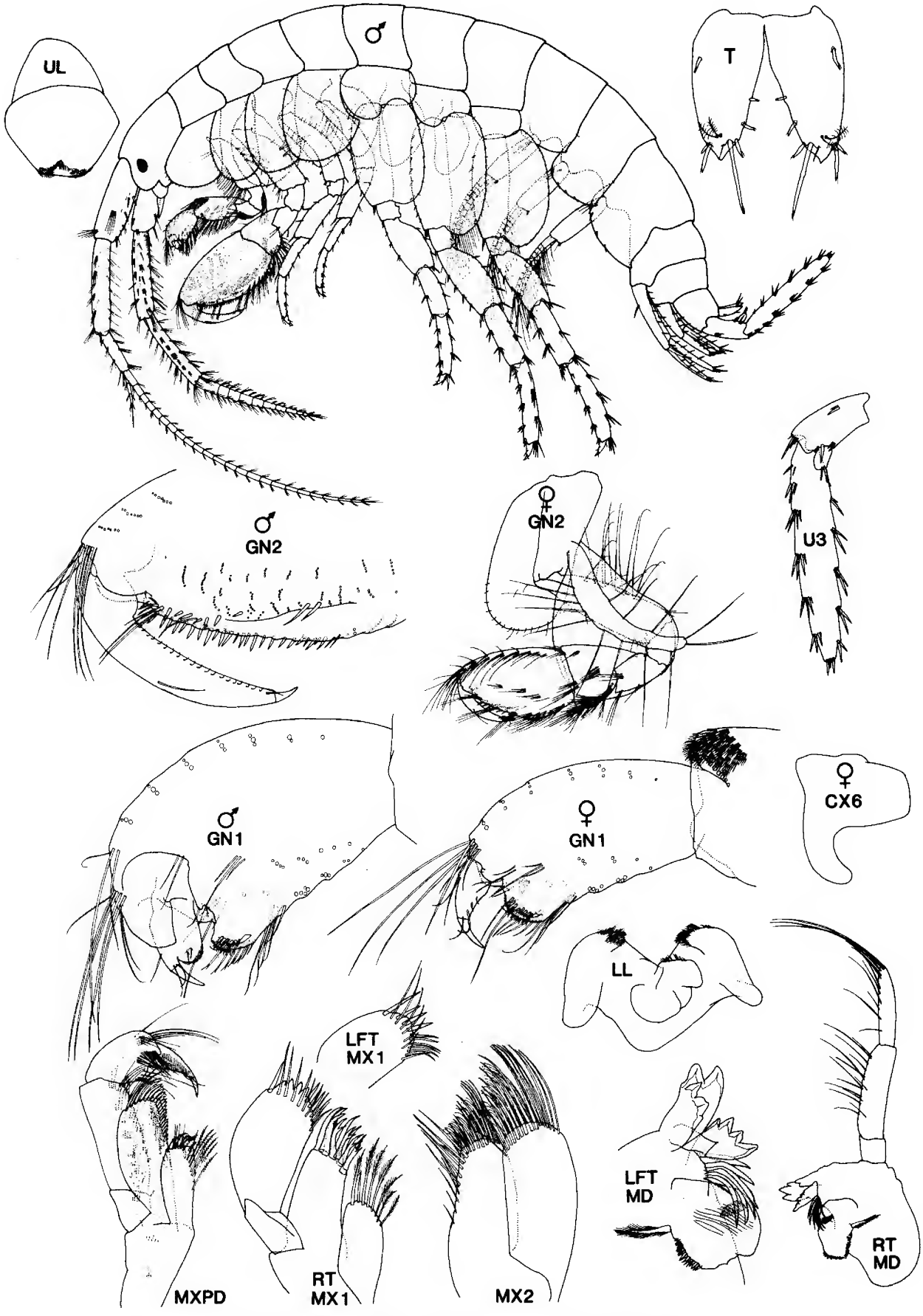

FIG. 34. ***Melita alaskensis,*** **new species. Hogan I. (A164), souheastern Alaska. Male (7.5 mm); female (7.0 mm).**

lower margin not noticeably serrate. Uropod 1, distal peduncular spine long, slender; tips of rami exceeding uropod 2, outer ramus slightly the shorter. Uropod 2, outer ramus the shorter, margins strongly spinose. Uropod 3, inner ramus very small; outer ramus strong, more than twice length of, but little broader than peduncle, margins with 5-6 clusters of medium spines, apex with short spines, lacking terminal segment.

Telson lobes medium, relatively broad, narrowing apically, inner margins with 2 short spines, apices subacute, each with 2-3 short, and one long, spines, lateral notches evanescent.

Coxal gills on peraeopods 2-5 medium large, saclike; gill on peraeopod 6 not grossly smaller or less broad than gill on peraeopod 5.

Female ov. (7.0 mm). Gnathopod 1, propod relatively slend-er, anterior margin convex, palm nearly vertical, strongly convex; dactyl regular. Gnathopod 2, carpus stout, shorter than, but as deep as propod; propod medium, with regular, oblique, nearly straight palm; dactyl regular.

Coxa 6, anterior lobe forming a deep, gently curved nearly hook-like process; stridulating ridges not observed.

Etymology. The species name alludes to its type locality in southeastern Alaska.

Distributional ecology. Known only from the type locality on Hogan I., southeastern Alaska, under boulders at LW level.

Taxonomic commentary. *Melita alaskensis* is very similar to *M. oregonensis* Barnard but differs in the characters of the key (p. 53) and the character states noted above.

Melita nitida (Smith)
(Figs. 35, 36)

Melita nitida Smith 1874.— Bousfield, 1973: 65, Pl. IX(2). —Levings & McDaniel, 1976: 5?—Austin, 1985: 610 (part).—Chapman, 1988: 372, fig. 5F.
Melita setiflagella Yamato, 1990: 80, figs. 2-6?
non *Melita nitida* Shoemaker, 1935: 70, fig. 2.

Material Examined.
BRITISH COLUMBIA:
South-central mainland, ELB Stns., 1959: N23 (head of Pendrell Sound), intertidal, July 16, 1959 - 1 male, 1 female ov., 2 juveniles.
Vancouver Island, ELB Stns., 1955: G5 (head, Comox Bay), intertidal, brackish - 2 males, 6 females ov.; G22 (Chemainus estuary), intertidal, brackish - 6 males, 3 females ov.
Vancouver Island, outer coast, ELB Stn. O6 (Louis Bay, Nootka I.), intertidal, July, 1959 - 1 specimen.

WASHINGTON:
ELB Stn.W11 (head of Oyster Bay), intertidal, brackish, muddy gravel, July 17, 1966 - 4 males, 1 female, 4 juveniles

OREGON:
ELB Stn. W65 (Tillamook Bay), intertidal, coarse sand, mud, Aug., 1966 - 22 male, female, and juvenile specimens.

Diagnosis. Male (5.5 mm). Anterior head lobe broadly rounded, inferior sinus squarely incised. Urosome 1 dorsally smooth. Urosome 2 with clusters of 3-5 short spines on either side of postero-dorsal margin. Antennae large, peduncles heavy. Antenna 1, hind margin of peduncle 1 with 3-4 short spines proximally; peduncle 3 medium; accessory flagellum very short, 2-segmented. Antenna 2, flagellum with 18-20 segments, armed strongly with "bottle brush" setae.

Lower lip, inner lobes small, indistinct. Mandible, palp segments slender, weakly setose; spine row with 4-5 blades. Maxilla 1, inner plate with 5-6 distal setae, right palp strongly broadened, apex 5-6 dentate. Maxilla 2, inner plate with 9-10 inner marginal setae. Maxilliped, inner plate with 8 inner marginal setae.

Coxae 1-4 medium deep, rounded below, increasing posteriorly. Gnathopod 1, basis, antero-distal margin densely setose; carpus slender, margins subparallel; propod more slender and shorter than carpus, little broadening distally, lower palmar margin strongly oblique. Gnathopod 2, basis less densely setose anterodistally; carpus, hind lobe narrow; propod, medial face with strong superior and inferior submarginal setal groups, and median toothed ridge.

Peraeopods 3 & 4, dactyls medium. Peraeopods 5-7, bases medium broad; bases of 6 & 7 narrowing distally to small hind lobes; segment 4 little broadened; distal segments spinose (not setose); segment 6 distinctly longer and more slender than 5; dactyls medium.

Pleon plate 3, hind corner squarish, slightly acuminate. Uropod 1, distal peduncular spine relatively short, weak; rami medium, subequal. Uropod 2, outer ramus distinctly the shorter. Uropod 3, outer ramus medium, 2.5 X peduncle, margins with 5-6 clusters of medium spines; apex subtruncate, with minute terminal segment and 4-5 short spines.

Telson lobes medium, separated to base, apical spines short, inner margins with short spines. Coxal gills medium, broadly saclike; gill 6 little smaller than gill 5.

Female ov. (4.0 mm). Gnathopod 1, carpus deeper than propod, lower margin convex; propod, palmar margin conmvex, nearly vertical; dactyl regular. Gnathopod 2, carpus relatively short and deep; propod relatively small, little longer than carpus, palmar margin regularly convex, lined with 8-10 short spines.

Coxa 6, anterior lobe modified to shallow, weakly hooked process, with lower submarginal row of 12-15 stridulating ridges or pits.

Distribution. In summer-warm brackish localities of southern B. C. and northern Washington; also in the Columbia estuary, parts of San Francisco Bay, and south of Pt. Conception.

Taxonomic commentary. Chapman (1988) summarized Pacific coast records of this synanthropic species

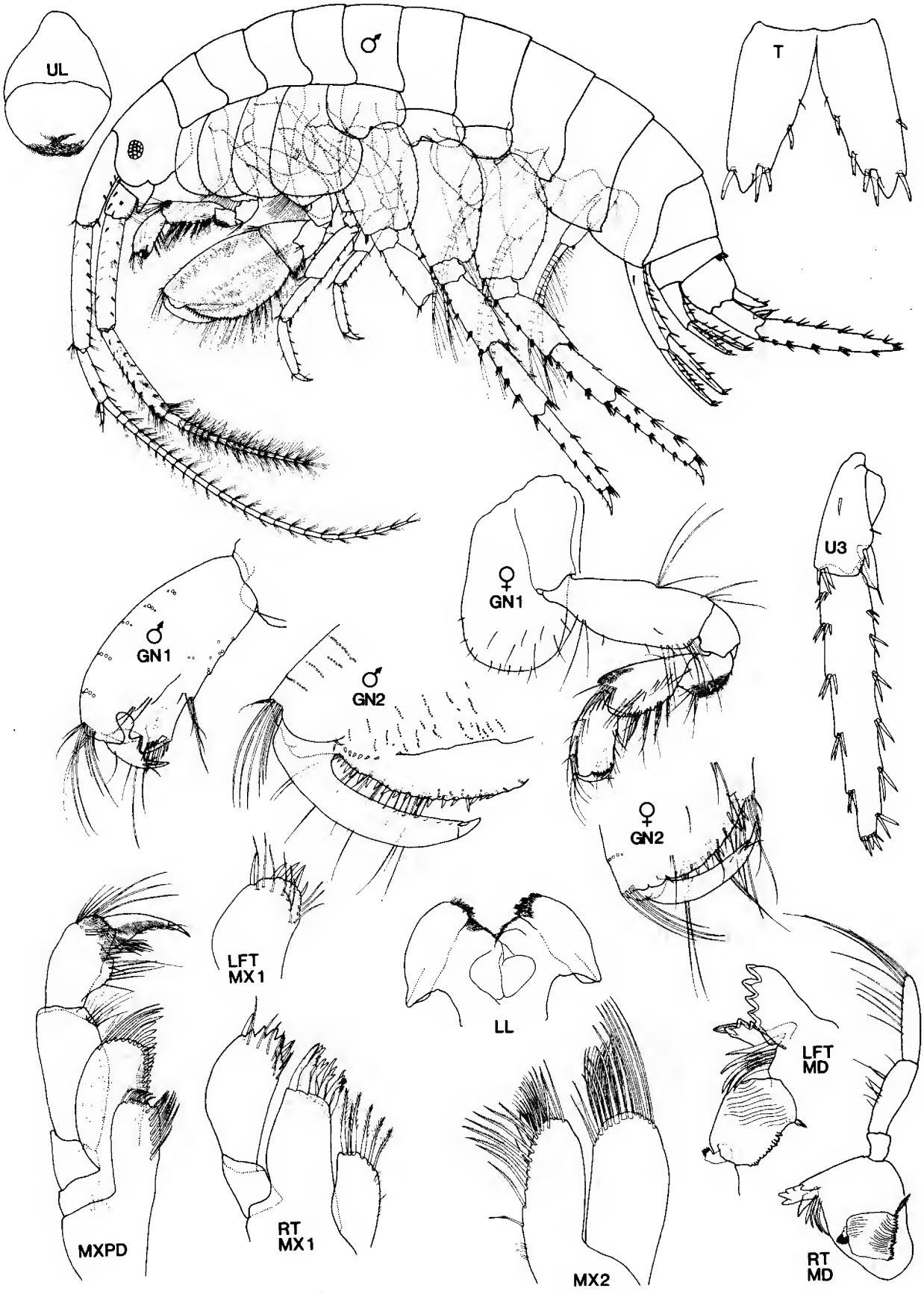

Fig. 35. ***Melita nitida*** **Smith, 1874. Oyster Bay (W11), Washington. Male (5.5 mm); female (4.0 mm).**

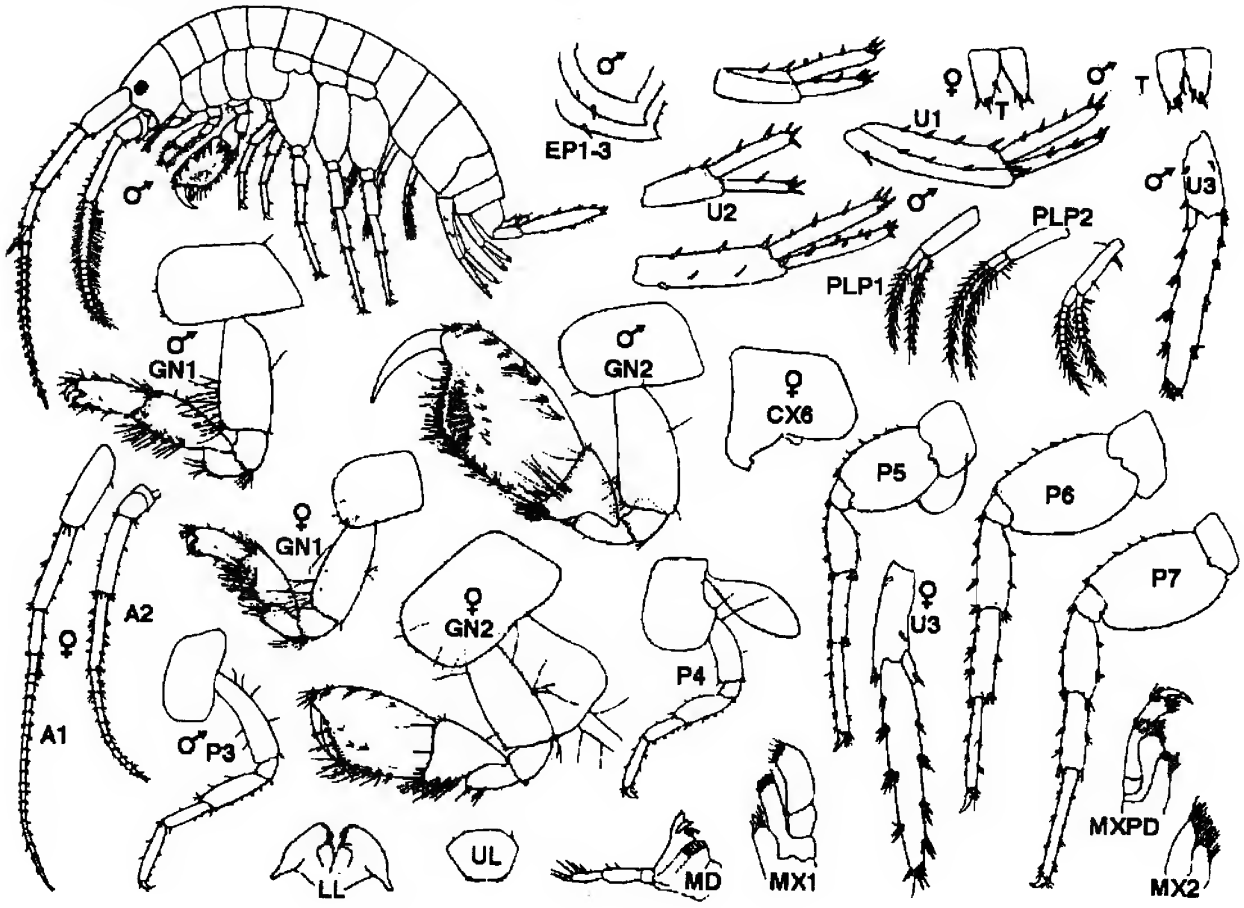

Fig. 36. *Melita nitida* Smith, 1974. Appalachicola estuary, Florida. Male (6.0 mm); female (4.0 mm). (after Sheridan, 1980)

from Howe Sound, Strait of Georgia, B. C., Yaquinna Bay, Oregon, and San Francisco Harbor, CA. He first detailed the structure of the anterior lobe and stridulating ridges of coxa 6 (female).

Dr. S. Yamato (pers. communic.) noted a close similarity between coxa 6 (female) of his material of *M. setiflagella* from Japan, and Chapman's (1988) material of *M. nitida* Smith from the North American Pacific coast. The eastern and western North Pacific populations are, indeed, very similar, in most character states, but should be compared closely with material from the type locality of *M. nitida* on the North American Atlantic coast, previously illustrated by one of us (Bousfield, loc. cit.).

Melita sulca (Stout)
(Fig. 37)

Caliniphargus sulcus Stout, 1913: 641.
Melita palmata (Montagu)? Wailes, 1931: 41.—Shoemaker, 1941b: 187.—Hewatt, 1946: 199.—Ricketts & Calvin, 1968 (4th edition): 39, fig. 23.—Austin, 1985: 609.
Melita sulca (Stout) J. L. Barnard, 1969b: 126, fig. 22.—Barnard, 1975: 361, figs. 42, 81, 154.—Austin, 1985: 610.—Staude, 1987: 373, 384.—Barnard & Barnard, 1983: 666.

Material Examined. The species was not found in present material, even though previously recorded from the study region (Barnard, Austin, Staude, loc. cit.).

Diagnosis. [partly after Stout (1912) and Barnard (1969b)]. Male (Stout: 5-8 mm) (Barnard: to 12.0 mm). Anterior head lobe broadly rounded; inferior antennal notch small, lower apex rounded. Urosome segment 1 with mediodorsal tooth. Urosome 2 with paired dorsal spines, each enclosed basally by pair of unequal teeth. Antennae relatively long. Antenna 1, peduncular segment 1, posterior margin with 4-5 short spines; segment 3 short, accessory flagellum with 2 1/2 segments. Antenna 2, flagellum longer than peduncle, margins with moderately strong "bottle-brush" setae.

Upper lip rounded below. Lower lip, inner plates small, indistinct. Mandible: spine row with 5 blades. Maxilla 1, inner plate with 8 apical plumose setae; outer plate with 7 apical spines; palp segment 2 expanded, apex with blunt spines and a few setae. Maxilla 2, inner plate with inner marginal apical setae, lacking facial row of setae. Maxilliped, outer plate large, inner margin with blunt spines.

Coxae 1-4 medium deep, 4th largest. Coxa 1 little broadened distally. Gnathopod 1, antero-distal margin of basis strongly setose; carpus slender, much longer than

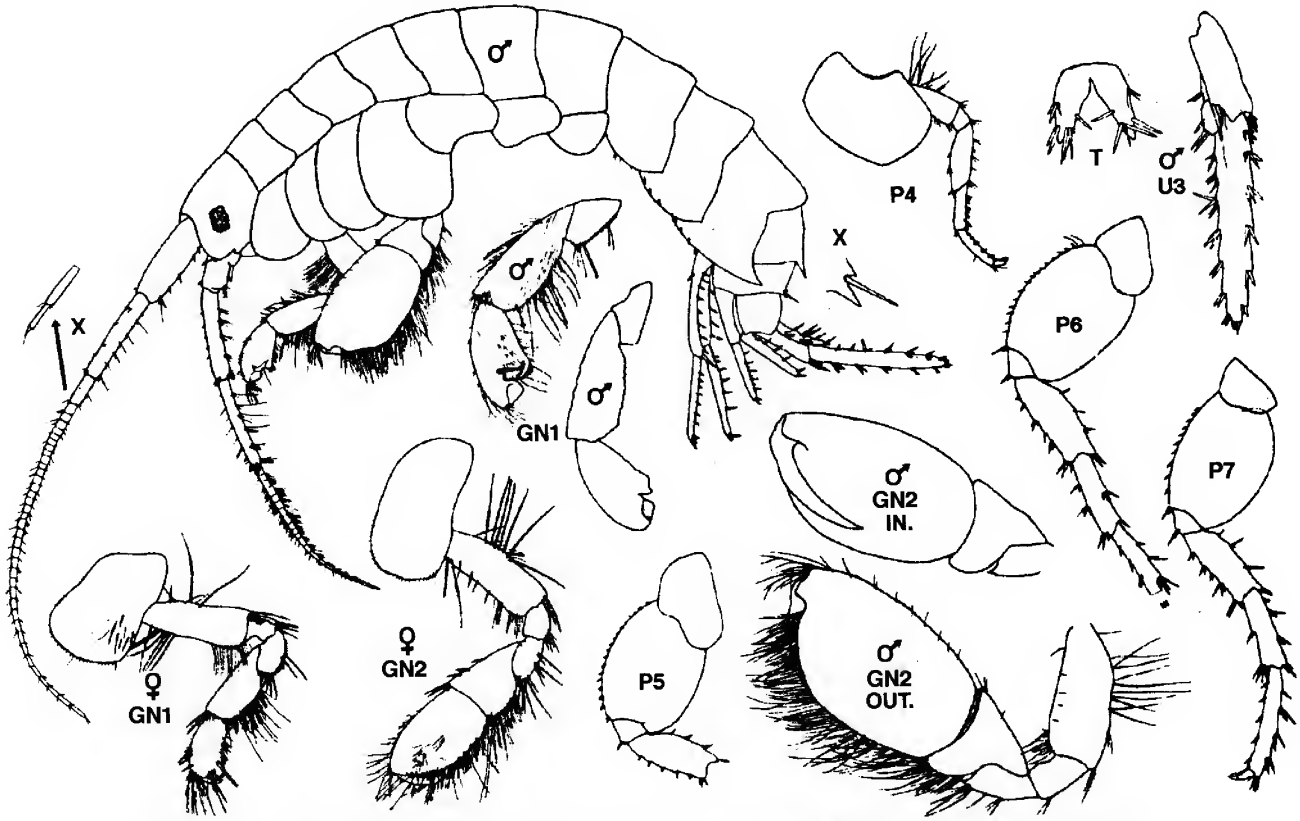

FIG. 37. *Melita sulca* (Stout). Southern California. Male (8-12 mm); female (5-9 mm). (after Barnard, 1969b)

propod; propod broadening distally, strongly overhanging very small dactyl having basal swelling. Gnathopod 2, carpus, hind lobe medium broad, rounded and setose below; propod large, deep, medial face and lower margin strongly setose; acute tip of smooth dactyl closing in deep median palmar depression.

Peraeopod 3 slightly larger than 4; dactyls short. Peraeopods 5-7, coxae shallowly anterolobate; bases broad, hind lobes medium; segment 4 little broadened; distal segments normally spinose (not setose); dactyls short.

Pleon plate 3 , hind corner produced, acute. Uropod 1, peduncle with medium distal spine; rami medium, margins strongly spinose. Uropod 2, rami subequal, margins spinose. Uropod 3, inner ramus small; outer ramus elongate, lacking terminal segment; margins with 5-6 clusters of spines.

Telson lobes short, separated to base, each apex with 2 small spines [strongly spinose, with spines on inner margins (fide Barnard, 1969b)].

Coxal gills and brood plates not described.

Female ov.(5.0 mm). Gnathopod 1, carpus longer and wider than propod, upper and lower margins subparallel; merus with stiff brush-like setules posteriorly; propod broadening distally, with convex setose palm; dactyl regular, larger and stronger than in male. Gnathopod 2 smaller than in male, carpus as deep as, but shorter than, propod; palmar margin more oblique. Coxa 6 not described, but probably possessing a strongly modified antero-ventral lobe.

Taxonomic and distributional commentary: Stout's original material was not re-examined by J. L. Barnard (loc. cit.); his redescription was based on fresh material from La Jolla, California.

This species has been recorded from Washington State and British Columbia by Barnard (1969b), Austin (1985) and Staude (1987). It has also been recorded sparsely from Central California (Carmel, Cayucas, Hazard Canyon, Morro Beach) but appears more common, under rocks at LW to depths of 100+ m., south of Pt. Conception to Baja California. The disparity in descriptive features, sizes, and habitats of material treated by Stout and Barnard (loc. cit.) suggests that more than one species may be involved, and that careful re-examination of all previous materials is therefore recommended.

Western Pacific species of *Melita*.

A rich assemblage of melitoid amphipod species from the Asiatic North Pacific coastal region has been assigned to the genus *Melita,* especially by Nagata (1965), Yamato (1887, 1888, 1890), Hirayama (1987), and Ishimaru (1994): *Melita shimizui* (Ueno, 1940) (see Yamato, 1988: 86, figs. 7-12); *M. koreana* Stephensen, 1944: 39, figs. 6-8 (see also Yamato, 1987, figs 7-9.); *M. rylovae* Bulycheva, 1955 (see also Yamato, 1987: 278, figs. 1-6); *M. nagatai* Yamato, 1987: 289, figs. 11-14; *M. bingoensis* Yamato, 1987: 294, figs.16-20; *M. setiflagella* Yamato, 1988: 80, figs. 2-6; *M. piloprotopoda* Hirayama, 1987: 11, figs. 227-231; *M. quadridentata* Yamato, 1990: 157, figs. 6-10; *M. hoshinoi* Yamato, 1990: 150, figs. 1-5; *M. laevidorsum* Stephensen, 1944: 44; and the aberrant *M. longidactyla* Hirayama, 1987: 2, figs. 221-224, and *M. tuberculata* Nagata, 1965: 295, figs. 28-29.

KEY TO WESTERN NORTH PACIFIC SPECIES OF *MELITA* SENS. STR.*

(*excluding *M. longidactyla* Hirayama and *M. tuberculata* Nagata)

1. Uropod 3, outer ramus with terminal segment; pleon plate 3 hind corner distinctly produced, acute . . 2.
—Uropod 3, outer ramus lacking terminal segment; pleon plate 3, hind corner squarish or finely acuminate (except. *M. piloprotopoda*) . . . . . 4.

2. Uropod 3, margins of outer ramus with clusters of long spines and setae; peraeopods 6 &7, segments 4-6 with marginal setae & spines . . . . . *M. quadridentata* Yamato.
—Uropod 3, outer ramus with ordinary spines only; peraeopods 6 & 7, distal segments with marginal spines only . . . . . 3.
3. Peraeopods 5-7, bases very wide, broadening distally; head lobe broadly rounded, lacking inferior notch; maxilla 1, palp segment 1 with "shoulder" setae. . . . . *M. piloprotopoda* Hirayama.
—Peraeopods 5-7, bases regularly broad or narrowing distally; head anterior margin with inferior antennal notch; maxilla 1, palp segment 1 lacking shoulder setae. . . . . 4.

4. Pleosome segments 1-3 very weakly toothed dorsally; coxa 4 deeper than coxa 3; gnathopod 1 (male), propod overhanging and masking small dactyl . . . . . *M. rylovae* Bulycheva.
—Pleosome segments 1-3 dorsally smooth; coxa 4 not deeper than 3; gnathopod 1 (male) propod not distally overhanging or masking dactyl . . . . . *M. hoshinoi* Yamato.

5. Peraeopods 5-7, bases narrow, hind lobes very small; uropod 3, outer ramus slender, elongate (>3X length of peduncle) . . . . . *M. laevidorsum* Stephensen.
—Peraeopods 5-7, bases normally broad, hind lobes normal, distinct; uropod 3, outer ramus normal, length about 2.5X peduncle . . . . . 5.

6. Antenna 2, flagellar segments strongly setose; telson, apical spines short . . . . . *M. setiflagella* Yamato.
—Antenna 2, flagellar segment normally setose or nearly bare; telson, apical spines long . . . . . 7.

7. Peraeopod 5, segment 4, distinctly broadened, width >2/3 length; accessory flagellum very short, 1+ segmented; peraeopods 5-7, dactyls medium strong . . . . . *M. shimizui* Ueno.
—Peraeopod 5, segment 4 normal, little broadened, width about 1/2 length; accessory flagellum regular, 21/2 - 4 segments; peraeopod dactyls short. . . . . 8.

8. Uropod 2, distinctly toothed (and spined) dorsally; coxa 6 (female) modified anterior lobe shallow, weakly "hooked"; .telson with strong lateral spines. . . . . *M. bingoensis* Yamato.
—Uropod 2 not (or very weakly) toothed dorsally; coxa 6 (female) modified, anterior lobe deep, strongly "hooked, posteriorly; telson lobes lacking lateral spines . . . . . 9.

9. Pleon plate 3, hind corner weakly acuminate; urosome 2 very slightly toothed above, with group of 3 spines on each side; gnathopod 1 (male), unguis of dactyl overhangs palm . . . . . *M. nagatai* Yamato.
—Pleon plate 3, hind corner squared or recessed; urosome 2, with spines in groups of 2, lacking teeth; gnathopod 1 (male), unguis of dactyl shorter than palm. . . . . *M. koreana* Stephensen.

Taxonomy commentary (see also Fig. 38).

Most western Pacific species listed above are clearly assignable to the genus *Melita,* as broadly defined, in having strongly sexually dimorphic gnathopod 1 and coxa 6, in lacking facial setae on the inner plate of maxilla 2, and in having a 1-segmented outer ramus of uropod 3. However the most typical members differ from the type species, *M. palmata* (Montagu) in the less strongly narrowed carpus and distally broadened propod of gnathopod 1, and in lacking a dorsal tooth on urosome 1, among other differences.

Two superficially similar Japanese species are particularly enigmatic. *Melita longidactyla* Hirayama, 1987, is clearly aberrant in gnathopod 2 wherein: carpal lobe relatively broad, setose; propod little expanded distally and the palmar margin very weakly toothed; dactyl strongly setose on the outer margin; maxilliped, palp segment 2 broadened medially (not columnar); dactyls of peraeopods 3-7 elongate; and uropod 2, rami subequal in length. Coxa 6 (female) has not yet been described or figured.

Melita tuberculata Nagata, 1965, with similar aberrancies, including a marginally smooth dactyl of gnathopod 2 (male), also has long slender peraeopod dactyls, and the telson lobes have short spines on the outer (lateral) as well as inner margins. The mouthparts and coxa 6 (female) have

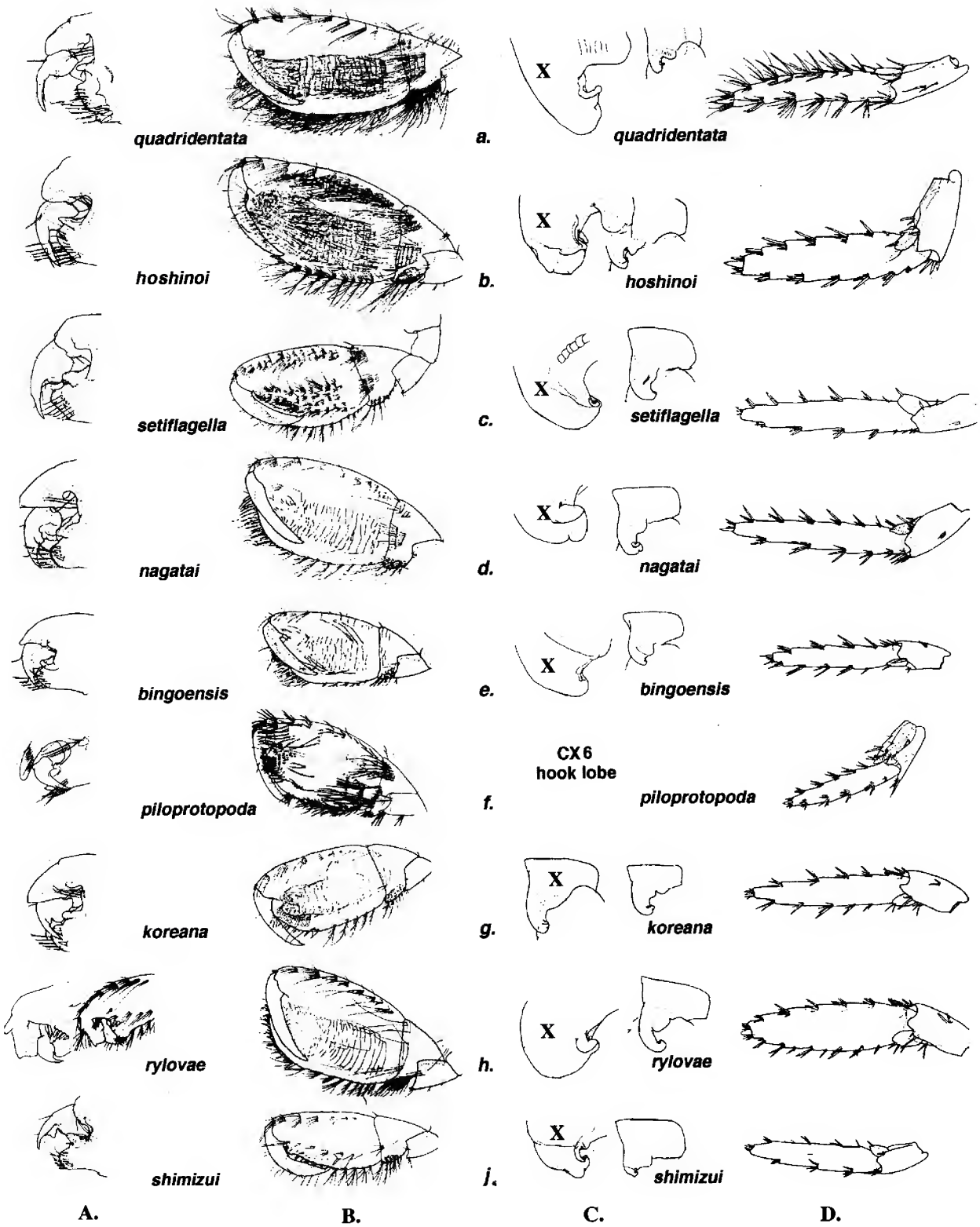

FIG. 38. Character States of Asiatic North Pacific Species of *Melita*: A, B. - Gnathopods 1 & 2 (male); C. - Coxa 6 (female); D. Uropod 3 (male) (Species a, b - after Yamoto, 1990; species c, j - after Yamoto, 1988; species d, e, g, h - after Yamoto, 1987; species f - after Hirayama, 1987).

also not been described. However, *M. tuberculata* differs markedly from *M. longidactyla* in its single dorsal teeth on pleon segments 1-3; the bases of gnathopods 1 & 2 are strongly setose antero-distally, the bases of peraeopods 5-7 do not differ markedly in size or form, and the accessory flagellum is 4-segmented (vs. 2-), among other differences. Pending further study of type and fresh material, in conjunction with re-assessment of the world-wide fauna of *Melita*, both species are candidates for separate generic recognition.

The Asiatic North Pacific species differ from the North Atlantic (type) group of *Melita palmata* in several important taxonomic features that suggest a need for further higher level taxonomic revision. Despite the excellent quality and completness of the work of Japanese authors (above), no material of the several species has been re-examined here, and such revision is beyond the scope of the present study.

Systematic and Biogeographic Analyses.

Some 23 species of the melitid group occur along the Pacific coast of North America. However, the material examined was only moderately extensive, amounting to about 300 species lots (stations), mostly all from rocky shore habitats, but some from subtidal sediments.

The melitid group within family Melitidae has long posed a complex and difficult taxonomic problem. During the past three decades, the difficulty has been greatly compounded by an almost exponential increase in numbers of new species and genera. The increase has resulted mainly from studies on the Indo-Pacific marine fauna (Ledoyer, 1967, etc., Barnard, 1972, etc.), the western North Pacific fauna (e.g., Hirayama, 1987; Yamato, 1990), and the hypogean, anchialine, and interstitial coastal marine faunas mainly of tropical regions (e.g., Stock, 1988, 1990; Vonk, 1988). Karaman (1981) attempted to impart some classificatory order into this growing melange of disparate taxa, with separation of the genus *Abludomelita* from *Melita* sensu *palmata).* However, his analysis was based mainly on a literature search wherein taxonomic characters critical to his diagnoses were not always depicted. Moreover, his diagnoses were based on a very limited number of characters and character states, and he apparently did not recognize, through limited examination of materials, some of the significant features then available (e.g., sexual differences of the gnathopods and coxa 6) that are reproductively (and thus highly) significant in natural classification of component members. The more recent work of Borowsky (1984), Conlan (1990) and others has revealed the behavioural significance of such taxonomic differences between the sexes and species.

The accumulation of extensive previously unstudied material from the North Pacific region has been especially revealing here. As noted above, the material is rich in both species and genera, many of which have proven new to science. Component species have revealed a plethora of previously unrealized characters and character states that have proven significant taxonomically. Some have led to more precise delimiting of Karaman's genus *Abludomelita* both with respect to the genus *Melita* sens. str. and to more closely related genera (p. 8). More correct ordering of these character states also tend to support the validity of other previously proposed natural groupings within the *Melita* group complex (e.g., *Eriopisa* and *Rotomelita* subgroups). Hopefully, however, the present study may provide the framework for revision of the worldwide melitid and hadziid family groups, based on re-examination of actual specimens. Such might compensate for the uneven treatment of critical characters and character states in the existing literature, and hopefully lead to recognition of other significant features.

This study details the systematics and distributional ecology and life styles of species of the *Melita* group previously known and newly discovered on the North American coastal marine region. A UPGMA cluster analysis, modified from that of Sneath and Sokal (1973), is utilized to assess the degree of morphological similarity of the taxa within a larger group taxon. The similarities are based on suitably selected and phyletically ordered character states for the taxa concerned. As explained in previous analyses (e.g., Jarrett and Bousfield, 1994; Bousfield & Hendrycks, 1994), the overall degree of phyletic advancement is indicated by a plesio-apomorphic index derived by summing the values for each character state for each taxon.

As noted above (p. 8), with respect to the "*Abludomelita*" complex of genera, no member of the genus *Abludomelita* Karaman, 1981, sens. str., based on the type species *A. gladiosa* Bate, 1862, has yet been found within the North American Pacific study region. However, some species from the Sea of Japan essentially match this generic diagnosis. The genus *Abludomelita* is here included in a phenogram of morphological relationships of North Pacific genera with the "*Abludomelita*" complex (Fig. 39). The corresponding 20 characters and paired character states are outlined in Table I. Four major groupings of the six generic level taxa occur at or above the 70% similarity level. These include a relatively primitive *Melitoides* group (P.-A. indices of 30-37), that clusters with the enigmatic species *?M. valida* (Shoemaker). These two species are mainly high Arctic in distribution (p. 71). The most advanced genus, *Desdimelita* (on the right), with P.-A. index of 51, clusters most closely with *Abludomelita* (sens. str.), and with a variant of that genus from the Sea of Japan. Near the centre of the chart, the primitive *Quasimelita* group of mainly subarctic and abyssal species, and the more advanced and more speciose arctic-boreal genus *Megamoera*, cluster less closely with the *Abludomelita* subgroup.

The general "vegetative" phyletic thrust within the *Abludomelita* generic complex has apparently proceeded towards specialization of the mouthparts (mainly by decrease in size of plates and palps, reduction of spines and setae), enhancement of the raptorial nature of gnathopod 2, reduction or loss of dorsal abdominal armature, "slenderizing" of the peraeopod bases, and the shortening and basal fusion of the telson lobes. Such direction may duplicate the simplification of mouthparts that apparently took place within the Talitroidea

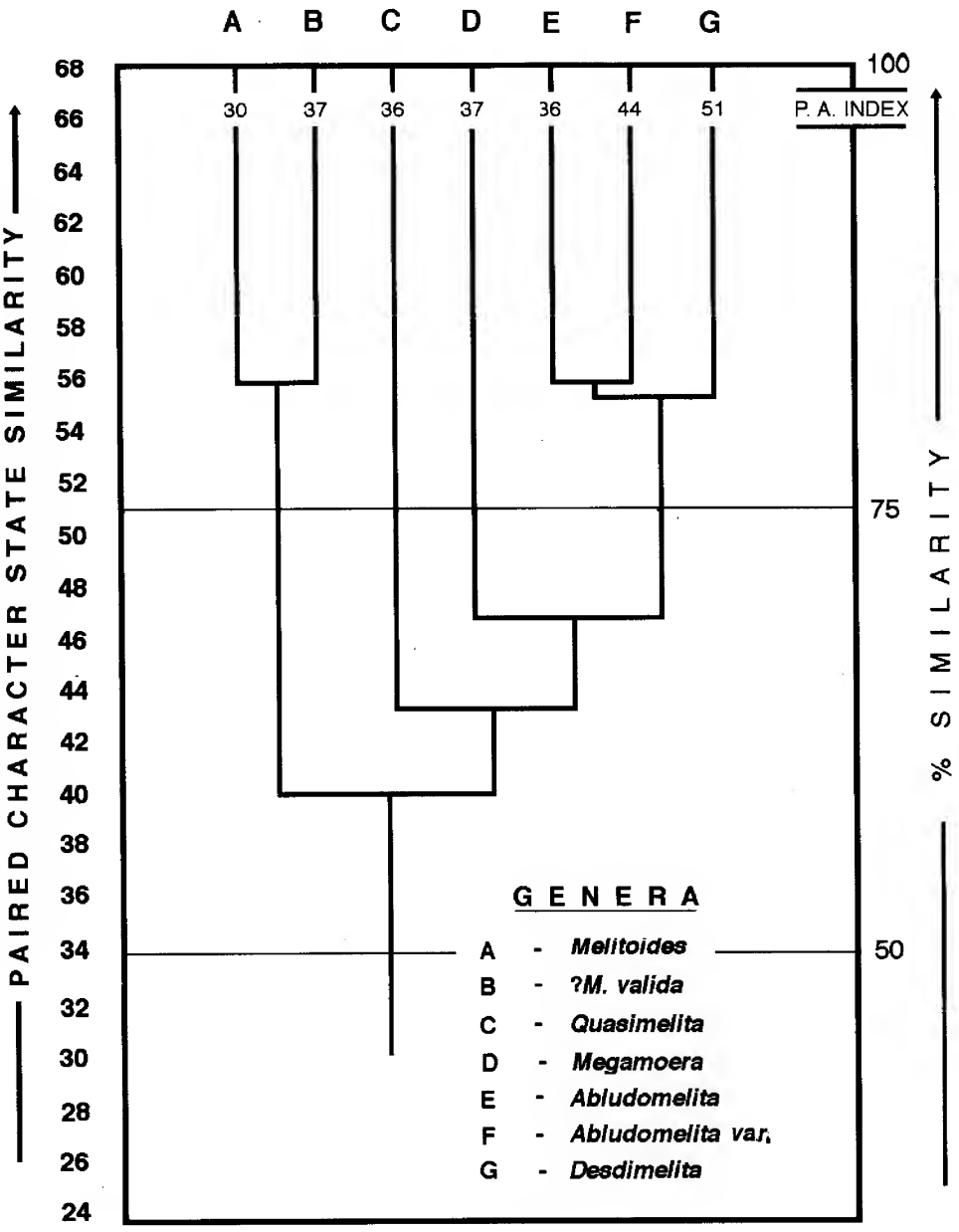

FIG. 39. PHENOGRAM: NORTH PACIFIC *ABLUDOMELITA* GENERIC COMPLEX.

as that group became more benthic, and more specialized for terrestrial and semi-terrestrial, rather than aquatic, food mastication. However, reduction of mouthparts and loss of setation may indicate a shift from a detritivorous or herbivorous feeding mode to a predatory life style. Specialization of the gnathopods for reproductive purposes, outlined above, apparently commenced within the *Abludomelita* complex where early steps in the evolutionary processes may yet be traced in the morphology of extant species. These evolutionary thrusts appear to have reached a pre-amplexing functional culmination in the genus *Melita* sens. str., and an agonistic behavioural (sound-production) apex within the genus *Abludomelita* sens. str. and the related tropical genus *Dulichiella* Stout. Behavioural studies on representative species of this evolutionary series would seem a recommended next step in testing conclusions based primarily on morphological considerations.

Morphological relationships of species groups within the genus *Megamoera* are indicated in Fig. 40. Three major groups within *Megamoera,* relatively closely related, cluster at 65% similarity levels or greater. The subgroups within each subgroup cluster at 70-75% or greater, viz.,(1) a ***subtener*** group, within which are the subgroups *pallida* (1 spp.), and *subtener* (3 spp.); (2) a ***dentata*** (type) group, within which are subgroups *mikulitschae* (1 sp.), *dentata* (2 spp.), and *kodiakensis* (3 spp.); and (3) an ***amoena*** group (aberrant, possibly transitional to *Melitoides.*)

The cluster analysis (above) is based on superficial characters and character states only, as outlined in Table II. The mouthparts are systematically significant but their character states can presently be utilized for only about two-thirds of the species. Full re-examination and redescription

TABLE I. CHARACTERS AND CHARACTER STATES: GENERA OF *ABLUDOMELITA* GROUP

CHARACTERS	CHARACTER STATES		
	Plesiomorphic 0	**Intermediate 1**	**Apomorphic 2**
1. Pleon segment 3, postero-dorsal teeth	strong	weak	lacking
2. Urosome segment 1, postero-dorsal teeth	strong	single	lacking
3. Urosome 2, postero-dorsal teeth	4, strong	4, weak	2 only
4. Antenna 1, accessory flagellum, number of segments.	5-6	4	2-3
5. Anterior head lobe, inferior marginal accessory lobe	lacking	weak	strong
6. Mandibular palp, segments 2 & 3, relative lengths	2>3	2=3	3>2
7. Maxilla 1, palp segment 1, number of lateral setae	0-2	3-5	6+
8. Maxilla 2, inner plate, facial setae	strong	reduced	weak, submarg.
9. Maxilliped palp, segment 2	very broad	sl. expanded	columnar
10. Gnathopod 1, degree of sexual dimorphism	0	slight	marked
11. Gnathopod 2, setation of dactyl	0-very slight	moderate	heavy
12. Gnathopod 2 (male), breadth of carpus	wide, lower margin setose	medium	narrow
13. Coxa 1, distal broadening	none	slight	pronounced
14. Coxa 4, depth relative to coxae 1-3	deep	subequal	shallow
15. Peraeopods 5-7, width of bases	very broad lobes distinct	normal breadth lobes regular	narrow lobes small
16. Peraeopods 5-7, size of dactyls	very small	medium small	medium, long
17. Pleon plate 3, hind corner	strongly produced	slightly produced	quadrate
18. Uropod 1, ramal spines	numerous		few (2-3)
19. Uropod 3, size of terminal segment of outer ramus	large, normal	small	lacking
20. Telson lobes, strength of distal marginal notches	strong, deep	small, shallow	lacking

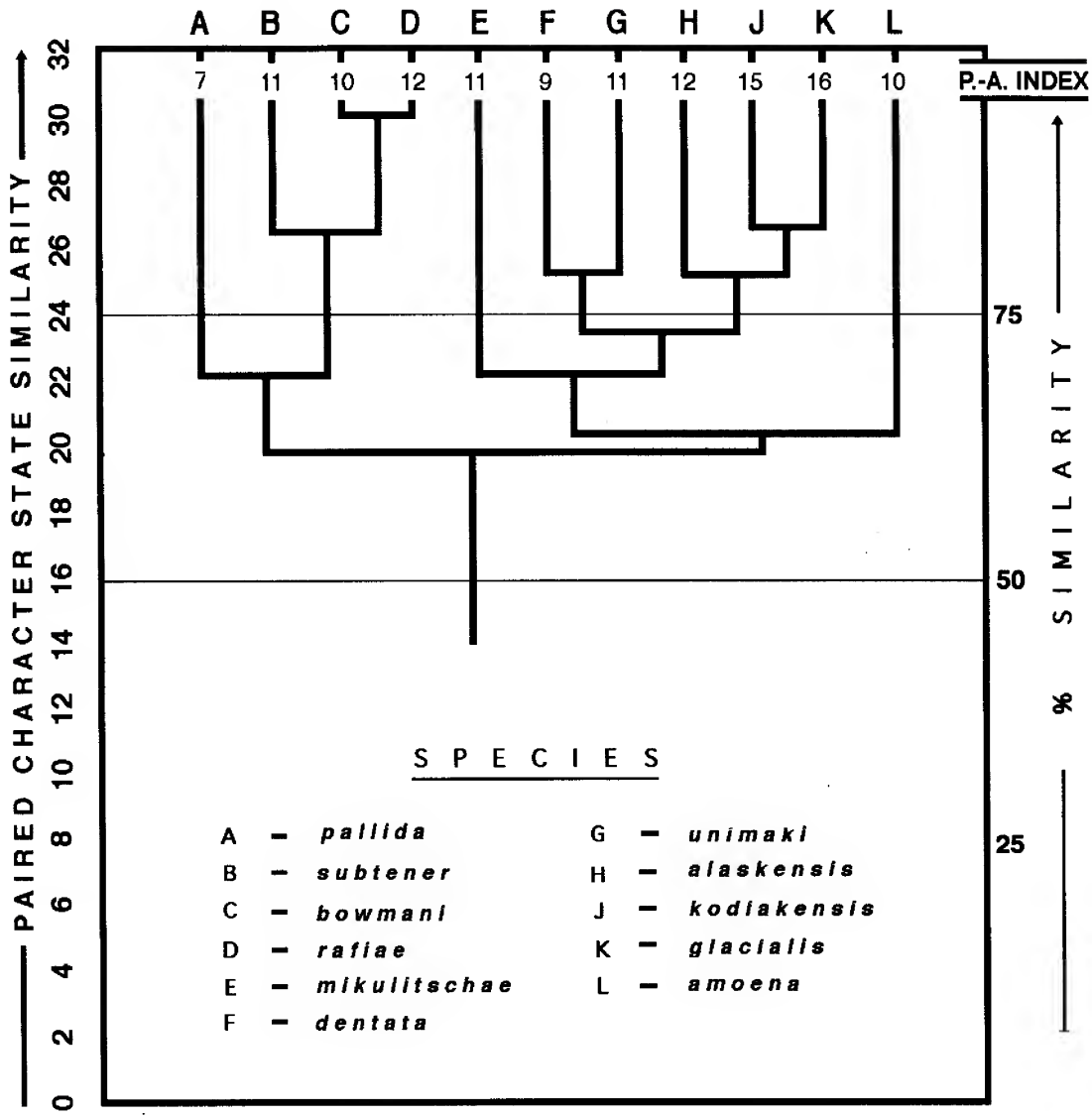

FIG. 40. PHENOGRAM: MAINLY NORTH PACIFIC SPECIES OF *MEGAMOERA*..

of those species, including both sexes where possible, is indicated for the solution of mouthpart relationships.

Taxonomic groupings within genus *Megamoera* are in concordance with distributional patterns of component species (Table IV). Thus, the *subtener* group is mainly North American; the *dentata* group is mainly Arctic and subarctic North American Pacific, but a few species also penetrates the Sea of Okhotsk and northern Japan Sea in the Asiatic subarctic. The *amoena* group is relatively primitive, and occurs in deeper shelf and slope waters.

Members of the *subtener-dentata* groups are closely related, all within 65%morphological similarity level and all but one (*M. pallida*) recorded within the North Pacific shelf region. More detailed taxonomic information is needed for precise placement of the *amoena* subgroup. *M. amoena* is perhaps surprisingly similar to *"Melita" lignophila* J. L. Barnard, and may form a relatively primitive connecting link with the western Pacific subgroup of *Abludomelita* (p. 10).

Cluster analysis of species within the genus *Melita* reveals relationships depicted in the phenogram of Fig. 41 (p. 68). At least 16 species of *Melita* occur in the North Pacific region of which 12 (including variants) occur along Asiatic shores and 4 along North American coasts. Distributionally, these occur in the southern parts of both coasts and appear to be limited northwards, on both coasts, possibly by thermal requirements for reproduction in this typically warm-water genus, but also by competition with the more diverse northerly and phyletically more primitive *Abludomelita* complex of genera and species.

Four major subgroups, each with components clustering internally at or above the 70% similarity level, and all 4 groups relatively closely related to each other, clustering at or above 60% similarity level, are as follows:
(i) a primitive *hoshinoi* group (Sea of Japan), with 2-segmented outer ramus of uropod 3, small postero-dorsal pleonal teeth, and hind corner of pleon plate 3 acutely produced.

TABLE II. CHARACTERS AND CHARACTER STATES: SPECIES OF *MEGAMOERA*.

CHARACTERS	CHARACTER STATES		
	Plesiomorphic 0	**Intermediate 1**	**Apomorphic 2**
1. Head, anterior lobe, super-numerary process	absent		present
2. Accessory flagellum, number of segments	5-6	4	2-3
3. Coxa 1, distal expansion	little		broadly
4. Gnathopod 1, degree of sexual dimorphism	barely discernible		distinct
5. Gnathopod 1, basis, antero-distal setae	weak		strong
6. Gnathopod 2, propod palmar teeth	lacking	weak	strong
7. Gnathopod 2 (male), dactyl, outer marginal setae	lacking		strong
8. Gnathopod 2, carpus	broad, distinct		short, deep
9. Peraeopods 3-4, dactyls	very short	short	medium to long
10. Peraeopods 5-7, bases	very broad	broad	rel. narrow
11. Peraeopod 6 (female), coxa, anterior lobes bifid	little or not		conspicuously
12. Pleon plate 3, hind process, accessory marginal teeth	lacking	weak	distinct
13. Pleon segment 3, dorsum, postero-distal teeth	strong	weak	lacking
14. Urosome 1, dosral teeth	strong/ 3+		weak/single
15. Uropod 3, outer ramus, no. of lateral spine clusters	6-7	4-5	2-3
16. Telson, inner margin spines	lacking	trace	2-3

(ii) an intermediate type (*palmata*) group, one representative only (*M. sulca*) on the North American Pacific coast.
(iii) a large, advanced, *nagatai* group, with 7 members, 5 in Asiatic region, 2 (*oregonensis-alaskensis*) in North America
(iv) a disparate, advanced *nitida* group of 2 species, 1 (*nitida*) introduced from the Atlantic coast to the North American Pacific region (Chapman, 1988), and the unique *M. laevidorsum* of the Asiatic Pacific coast.

Several distinct types of "*Melita*" are represented here, all candidates for further phyletic and classificatory analysis. However, material was not available and such analysis is beyond the scope of the present study.

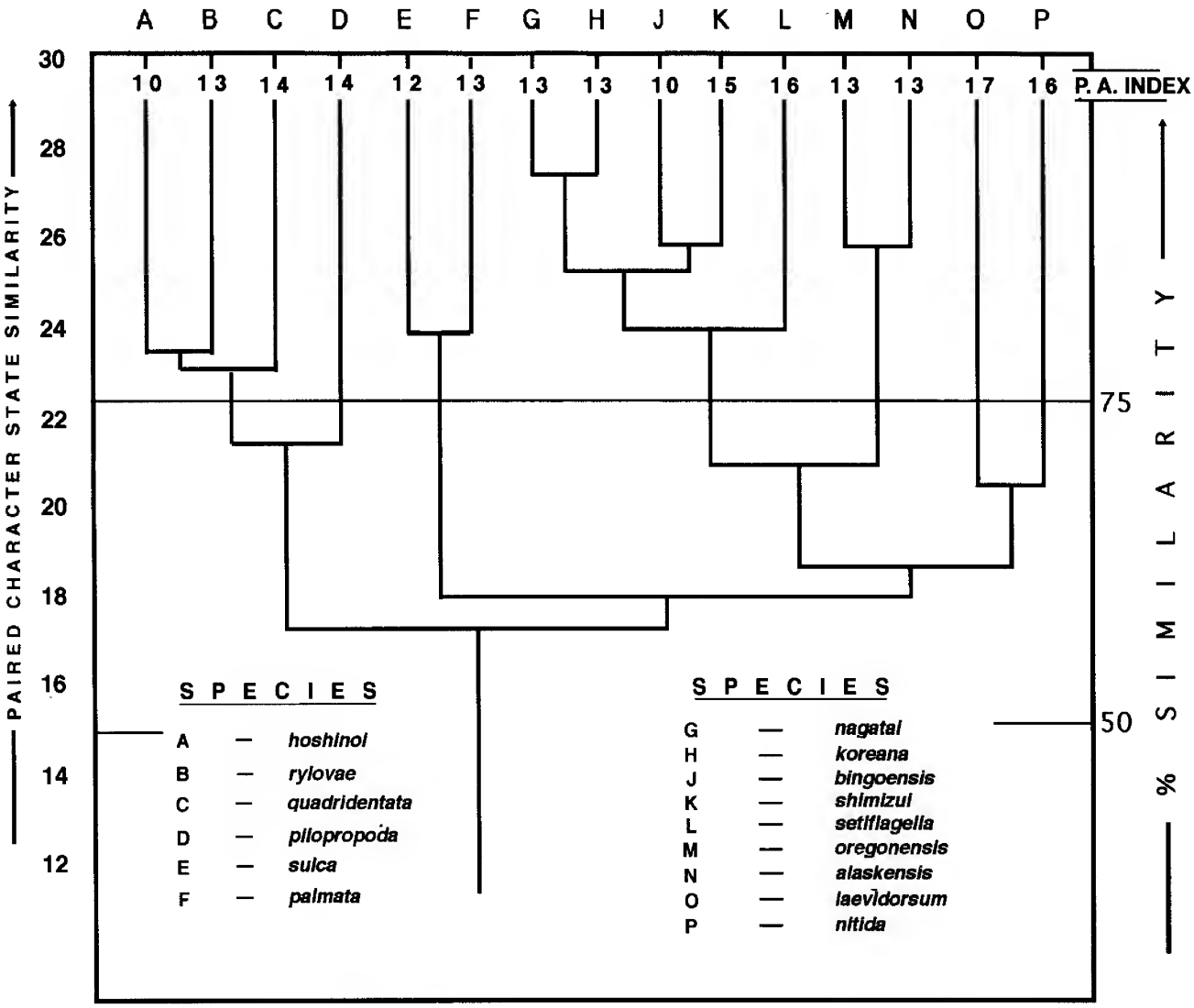

FIG. 41. PHENOGRAM: NORTH PACIFIC SPECIES OF *MELITA* LEACH.

BIOGEOGRAPHICAL ANALYSIS

The North Pacific intertidal and subtidal melitid fauna contains 39 species in 6 genera of which the *Abludomelita* complex contains 23 species in 5 genera, and the *Melita* subgroup 16 species in genus *Melita* (Table IV, p. 72). Within the *Abludomelita* complex, species of three genera (*Megamoera, Melitoides,* and *Quasimelita*) are essentially arctic and subarctic in distribution, whereas species of the other two genera (*Abludomelita* and *Desdimelita)* are essentially boreal or cold temperate. These have not authentically been recorded either from the Bering Sea to the north, or the warm temperate waters of California and Sea of Japan to the south.

Of the 9 regional species within genus *Megamoera,* only 2 species (*M. dentata* and *M. mikulitschae*) are known from the Asiatic coast, whereas all nine species (7 endemic) have been taken along North American Pacific shores. Greatest species diversity was found in southeastern Alaska (zone 4). The four regional species of *Melitoides* and *Quasimelita* have not been recorded south of the Bering and Okhotsk Seas. Members of these three genera tend to occur deeply subtidally, where their powerfully toothed gnathopods and reduced setation of maxilla 2 suggest a mainly predatory, rather than detritivorous or herbivorous life style.

By contrast, the four species of *Abludomelita* var. are narrowly endemic to the northern and central Sea of Japan. The six species of its counterpart genus, *Desdimelita,* are endemic to the North American Pacific coast, from southeastern Alaska to central California, with greatest species diversity from southern British Columbia to Washington and Oregon. As in *Dulichiella,* the well developed facial setae of maxilla 2 may suggest an essentially detritivorous life style.

Within the genus *Melita,* all 12 known species of the Asiatic North Pacific coast, and all four species of the North American coast are regionally endemic. Component subgroups are not closely related (phenogram, fig. 41). Only one species of the Asiatic coast *(M. setiflagella)* shows close similarity, in some character states, with one species of the

TABLE III: CHARACTERS AND CHARACTER STATES: SPECIES OF *MELITA*

CHARACTERS	CHARACTER STATES		
	Plesiomorphic 0	**Intermediate 1**	**Apomorphic 2**
1. Urosome 1, dorsal tooth	Present	trace	lacking
2. Urosome 2, number of dorsal teeth	4	2	0
3. Urosome 2, number of dorsal spines on each side	3-4	2	1
4. Antenna 1, peduncular segment 1 no. of posterior marginal spines	2	4	6
5. Antenna 2, flagellar segments "bottle brush" setation	weak	medium	strong
6. Mandibular palp, segment 3 setation	normal, strong		very weak
7. Maxilla 1, number of inner plate inner marginal setae	9-10	7-8	5-6
8. Peraeopods 5-7, size of dactyls	very short	medium	long, strong
9. Peraeopod 5, segment 4 expansion	normal width< 1/2 length		broad width = 2/3 length
10. Peraeopod 6, coxa (female) form of anterior lobe	shallow weakly "hooked"		deep strongly "hooked"
11. Peraeopods 5-7, form of basis	uniformly broad		narrowing
12. Peraeopods 5-7, segments 5-6. armature	hind lobe normal spines only		hind lobe small setae & spines
13. Uropod 1, size of distal peduncular spine	small	medium	large, strong
14. Uropod 3, outer ramus, terminal segment	present, distinct	small	lacking
15. Telson, apical spines	long, strong		short, weak

North American coast (*M. nitida*). However, the phenogram (above) would suggest that the two species are similar at the 60% level only, and thus not very closely related.

Most species of *Melita* are intertidal and shallow subtidal in depth range and occur frequently in under-rock habitats. However, in two species (*M. longidactyla, M. pilopropoda*) the basis and segment 4 of peraeopods 5-7 are much broadened, and the dactyls elongate, perhaps indicating a preference for sedimentary habitats at greater depth.

The 12 species of the genus *Melita* dominate temperate and warm temperate regions of the Sea of Japan. Similarly, two of the four species of *Melita* on the North American Pacific coast, *M. sulca* and *M. nitida*, occur only in summer warm waters , from southern California sporadically northward to the Strait of Georgia. These show closer similarity to North Atlantic species. The other two species, *M. oregonensis* and

M. alaskensis, with closer morphological similarity to the Asiatic Pacific fauna, occur mainly in cold-temperate waters, from central California north to southeastern Alaska.

The relatively primitive *Abludomelita* complex appears much more diverse in the North American than the Asiatic Pacific coastal marine region. Member species exhibit intermediate stages in evolution of the sexually dimorphic gnathopod 1 and coxa 6, and unique precopulatory "carrying" behaviour first described by Borowsky (1984), that attains a maximum degree of complexity within the genus *Melita* Leach. The North Pacific thus appears to be a centre of origin and evolution for the entire *Melita* group of genera and species. The group appears to be the most advanced subgroup within family Melitidae (p. 6) and perhaps one of the more recent invaders of regional under-rock habitats, even in competition with a very diverse regional cold-water anisogammaridan fauna (Bousfield, 1979). The relationship of melitid species to the two relict species of Mesogammaridae in the North Pacific region is obscure, but is probably convergent both in form and ecological preference.

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TABLE IV. DISTRIBUTION OF SPECIES OF THE *ABLUDOMELITA* AND *MELITA* GENERIC COMPLEXES IN THE NORTH PACIFIC REGION.

TAXON	BIOGEOGRAPHICAL ZONE								
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Megamoera Bate									
mikulitschae (Gurjanova)		X	X						
dentata (Kroyer)	?	?	X	?					
unimaki, new species			X						
rafiae, new species				X					
glacialis, new species				X					
borealis, new species,				X					
kodiakensis (J. L. Barnard)				X					
bowmani, new species				X	X				
subtener (Stimpson)				X	X	X	x?		
Melitoides Gurjanova									
makarovi Gurjanova		X	X						
valida (Shoemaker)?			X						
Quasimelita, new genus									
quadrispinosa (Vosseler)		X	X						
formosa (Murdoch)			X						
Abludomelita Karaman, var.									
somovae (Bulycheva)	X	?							
japonica (Nagata)	X	?							
denticulata (Nagata)	X	?							
unamoena (Hirayama)	X	?							
sexstachya (Gamo)	X								
Desdimelita, new genus									
microphthalma, new species				X					
microdentata, new species				X	X	X	X		
desdichada (J. L. Barnard)				x	X	X	X	X	
californica (Alderman)					X	X	X	X	
barnardi, new species					X				
transmelita, new species						X			
Melita Leach									
Western North Pacific com-	X								
plex of 12 species of *Melita*	X								
alaskensis, new species				X					
oregonensis J. L. Barnard					X	X	X		
nitida Smith					X	X	X	X	
sulca (Stout)					x	X	X?	X	X

BIOGEOGRAPHICAL ZONES

1. Sea of Japan; 2. Sea of Okhotsk; 3. Bering Sea & Aleutians; 4. Southeastern Alaska; 5. Northern B. C.; 6. Southern B. C.; 7. Washington-Oregon; 8. Northern & Central California; 9. Southern & Baja California

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LEGEND FOR FIGURES

A1	-	antenna 1	IN.	-	inner face	PLEOS	-	pleosome
A2	-	antenna 2	I. P.	-	inner plate	PLP	-	palp
ABD	-	abdomen	LFT	-	left	PLP 1-3	-	pleopods 1 - 3
AC. Fl.	-	accessory flagellum	LL	-	lower lip	RDGS.	-	ridges
CX	-	coxal plate	MD	-	mandible	RT	-	right
DCTL	-	dactyl	MX1	-	maxilla 1	SEG	-	segment
DORS	-	dorsal	MX2	-	maxilla 2	STR.	-	stridulating
EP 1-3	-	epimeral plates 1-3	MXPD	-	maxilliped	T	-	telson
GN1	-	gnathopod 1	O. P.	-	outer plate	U1-3	-	uropods 1-3
GN2	-	gnathopod 2	OUT.	-	outer face	UL	-	upper lip
HD	-	head	P 3-7	-	peraeopods 3-7	UROS	-	urosome
IMM.	-	immature	PLEON	-	pleon			